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70FR 44127

(7)

D. R. Woodlan, Chairman
Integrated Regulatory Affairs Group
P.O. Box 1002, Glen Rose, Texas 76043

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STARS-05013

October 5, 2005

Chief, Rules and Directives Branch, Division of Administrative Services
Office of Administration, Mail Stop T6-D59
U. S. Nuclear Regulatory Commission
Washington, DC 20555-0001

STRATEGIC TEAMING AND RESOURCE SHARING (STARS)
COMMENTS ON DRAFT GENERIC LETTER REGARDING
INACCESSIBLE OR UNDERGROUND CABLE
(70 FR 44127 OF AUGUST 1, 2005)

Gentlemen:

Attached are comments from the Strategic Teaming and Resource Sharing (STARS)[1] nuclear power plants on the draft generic letter regarding inaccessible or underground cable as published for comments (see 70 FR 44127 dated August 1, 2005). The STARS plants have reviewed the documents and detailed comments are attached.

In general, the STARS plants do not feel that the current cable performance information supports the need for this generic letter. At best, the NRC should work with the Nuclear Energy Institute (NEI) to continue collecting and analyzing data. Certainly the scope of any such generic letter should be examined carefully. The draft generic letter sent out for review has over generalized the cable problems that have been identified, resulting in a scope that is way beyond what would be appropriate. The draft generic letter seems to be imposing testing that may not be meaningful and, in fact, may actually be harmful. In summary, the STARS plants do not believe this generic letter should be issued at this time. If a generic letter on cable performance is ever issued, the letter should be more focused on the specific cables (type, voltage level, application, etc.) which have demonstrated generic problems and have real potential safety impacts.

[1] STARS is an alliance of six plants (eleven nuclear units) operated by TXU Power, AmerenUE, Wolf Creek Nuclear Operating Corporation, Pacific Gas and Electric Company, STP Nuclear Operating Company and Arizona Public Service Company.

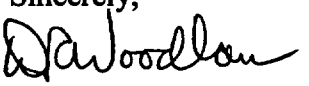
E-RIDS = ADM-013
Add = A. MARKLEY (AWM)
T. Koshy (TXK)

STSP Review Complete

Template = ADM-013

The STARS plants appreciate the opportunity to comment on this draft generic letter. If there are any questions regarding these comments, please contact me at 254-897-6887 or dwoodla1@txu.com.

Sincerely,



D. R. Woodlan, Chairman
Integrated Regulatory Affairs Group
STARS

No.	Section	Comment
1.	(General – Scope and Intent)	The draft generic letter (DGL) Summary references the monitoring of inaccessible or underground electrical cables. Underground cables would be considered inaccessible but the DGL wording indicates there is another group of cables which needs to be monitored. The DGL and Generic Letter 2002-12 examples have dealt with cables installed in environments below ground level. The DGL's Background makes reference to buried conduits, cable trenches, cable troughs, duct banks, etc., which are all underground environments except for possibly cable troughs. The DGL, however, continues to provide a brief discussion on cable wetting and condensation, and in fact states certain plants have experienced failures in cables routed underground or in other inaccessible paths. Does the scope of this DGL apply to above ground (inaccessible) cable paths? If so, it is unclear what these configurations would be. With no references to or examples of the other implied cable group and the DGL's title and summary not coinciding with the letter's text, the scope and intent of the DGL is unclear.
2.	(General – Scope)	Past Generic Letter examples have dealt with cable submergence/immersion and the impact submergence may have on cable life expectancy since most cables were never tested for life expectancy for long term submergence. The DGL should focus on underground installation environments. Cable wetting and condensation issues should not be included in the scope of this DGL since cables are designed for wet environments (not including submergence) and have been tested for forty (40) year life.
3.	(General – Scope)	Water treeing acting in conjunction with electrical stress treeing has a probable risk for ultimate cable failure at some point in time. However, there is no evidence that electrical stress in low voltage cable applications is sufficient enough to cause a cable failure. It is believed and documented (EPRI) that electrical stress impact on 5Kv cable is minimal. However, past Generic Letter examples do not support the belief. Therefore, the 5Kv cables should be included in the DGL, but lower voltage cables should not be within the DGL's scope.

No.	Section	Comment
4.	(General – Scope)	The scope of this Generic letter is too broad. It covers both low voltage (LV) and medium voltage (MV) cables for all systems scoped in the maintenance rule. References are made throughout this letter to safety related, accident-mitigation systems, risk significant cables, emergency diesel generators, offsite power and emergency core cooling systems. The scope of this letter goes beyond long term submergence and includes inaccessible cables that are exposed to moisture from condensation as well as wetting in inaccessible locations. The basis of this proposed generic letter is the same as that of Information Notice IN 2002-12 which is a concern that a potential common-mode failure of underground cables that affect the operability of accident mitigating systems. The NRC's concern stems from reviewing 23 License Event Reports (LERs) and morning reports since 1988 that identified these failures, and they believe these reported events are only a fraction of all failures since not all cable failures are reportable. IN 2002-12 was issued in 2002 and was only limited to MV cables in wet or submerged underground conduits. The proposed Generic letter expands the scope to include LV cable as well as MV cables.
5.	(General – scope)	The scope of requested information should be limited to only cables not rated for submergence to be consistent with problems identified in the letter.
6.	(General – Basis for generic letter)	Cables documented as failing as a result of being water immersed are indeed not meeting their intended 40 year life expectancy. This is somewhat justified in that most cables were not tested or qualified for water immersion, but only for wet environments. The thirty-five (35) insulation failures referenced in the DGL are of concern, but does not indicate a trend since 1988. To imply there are many more cable failures than what is being reported is not a proven fact or verifiable, but highly subjective. If the DGL believes this to be true, then all cables could be brought into the scope of the DGL since cable failures are not being reported.

No.	Section	Comment
7.	(General – Applicability and need)	Based on NEI's work to date, preliminary data indicates that there is no evidence that there is a generic issue with cables installed in a wet or submerged environment. 70% of the Units that responded to the survey thus far have reported no failures and the plants with cable failures are taking appropriate action. The dominant contributors reported to early failures of wet underground cable are manufacturing defects and damage during or following installation. The older types of XLPE and black EPR cables that were reported to fail early are being eliminated and are being replaced predominantly with red EPR and thereby increasing the longevity of the overall cable systems. The new Okonite red EPR (post 1974) cable manufacturing process and cable formulation is better than the old black EPR and there have not been any reported aging related failures. The NRC emphasis should be on what the plants that have problems are doing about it and not to force all plants into using a test until it is proven to be meaningful and effective.
8.	(General – Timing)	Based on IN 2002-12, NEI was tasked in 2004, to work with the nuclear industry to determine the extent of the problem and issue a white paper with their findings and to develop and present proposals to the NRC. NEI is conducting a survey of all plants to determine the number and type of MV cables installed at each plant and the percentage of underground cables. The survey also requests information about the number of failures and the types of cables involved that occurred at each plant. When NEI's work is complete, there will be real failure data from all plants for the NRC to work with instead of speculations. This NEI work is still ongoing and the NRC should wait till this effort is completed and have a better informed and complete picture before issuing any letters.
9.	(General – Testing)	In general, the suggested newer diagnostic techniques (low frequency AC, PD, etc.) that are currently available are still unproven, unpredictable, not consistently reproducible. These tests have not been used long enough to validate their effectiveness at early detection of potential failures or to validate that the tests do not cause premature failure. There is no consensus among the various industry experts on what tests to use for the various voltage classes and insulation types of cables in use and what acceptance criteria to use. There is no known ultimate failure mechanism for EPR and thus identification of a useful test for monitoring aging has not been possible. Physical logistics of some of the larger test equipment make them impractical for most power plant applications and the lack of a consistent ground plane makes testing for insulation resistance, high voltage and partial discharge ineffective.

No.	Section	Comment
10.	Purpose: "(1) ... potential susceptibility of certain cables to affect the operability of multiple accident-mitigation systems...."	Most degradation mechanisms would cause medium voltage cables to fail randomly and would not affect the "operability" of multiple accident-mitigation systems (i.e., the degradation would affect reliability not represent a common mode failure affecting operability). Electrical degradation of low voltage cables is not expected because of the low electrical stresses in the insulation. EPRI report NP-7485 defines cable operability as the continued ability of the cable to support the performance of its connected equipment's nuclear safety-related function which includes being able to support the function of the connected equipment even when the cable is exposed to harsh environments related to accidents. With safety-related equipment there are typically surveillance procedures which demonstrate "operability," i.e., the ability of the equipment to perform its safety related functions under normal plant operating conditions.
11.	Purpose: "(2) ... Adequate monitoring will ensure that cables will not fail abruptly and cause plant transients or disable accident mitigation systems when they are needed...."	Both medium voltage cables and low voltage cables typically fail to ground rather than phase to phase. In an ungrounded or high resistance ground system a single ground fault will not cause an abrupt failure causing plant transients or immediately disable accident mitigation systems but instead will bring in a ground alarm alerting the operator of a problem and provide time for orderly troubleshooting and repair of the problem cable. If ground fault tripping is used in a plants design, a cable failure could cause plant transients and disable accident mitigation systems immediately.
12.	Purpose: "Adequate monitoring will ensure that cables will not fail abruptly and cause plant transients or disable accident mitigation systems when they are needed..." Discussion: "The following are examples of risk-significant cable failures... "...the potential failure of the de-energized safety systems might only be revealed during a demand for the mitigation capability...." Requested Information: "(2) ... inaccessible or underground cables used to support EDGs, offsite power, emergency service water, service water, component cooling water and other systems that are within the scope of 10 CFR 50.65 (the Maintenance Rule)...."	The scope of the generic letter is unclear. Reference is made to all of the following: • accident-mitigation systems • risk-significant cables • safety systems • EDGs, offsite power, emergency service water, service water, component cooling water, and other safety systems within the scope of 10 CFR 50.65 (the maintenance Rule)

No.	Section	Comment
13.	Background	While a number of cable failures have occurred though out the industry, the proportion of failures to the millions of feet of installed cable is very low especially in low voltage power and control and instrumentation cables.
14.	Background	Medium and low voltage cables of similar construction to those installed in nuclear power plants are installed by the millions of feet in distribution systems throughout the country and the world. Most are exposed to wetting and are in inaccessible locations such as buried conduits, etc. Why not learn from the power distribution industry rather than basing regulation on the relatively small population of cables installed in nuclear power plants?
15.	Background: "Several other plants have reported water removal problems but have not yet reported any program for the early detection of potential failures...."	At Diablo Canyon, periodically draining manholes, maintaining sump pumps, etc., in order to remove standing water in pull boxes to minimize the duration cables are exposed to water has proven effective at minimizing in service cable failures for medium voltage cables.
16.	Background: "Several other plants have reported water removal problems but have not yet reported any program for the early detection of potential failures...."	Diagnostic techniques that are currently available have limited applicability and may be controversial in that some engineers believe they should be used and others believe they deteriorate the cable to the point of premature failure. Some of the newer techniques (low frequency AC, PD, etc.) have not been used long enough to validate their effectiveness at early detection of potential failures or to validate that the tests do not cause premature failure. There is no consensus among the various industry experts on what tests to do for the various voltage classes and insulation types of cables in use and what acceptance criteria to use. Trending of megger readings, TDR or other types of tests may work in a laboratory under tightly controlled environmental conditions but is not effective in a real operating power plant. Additionally there is a lack of baseline data for installed cables to compare to.
17.	Background: "Several other plants have reported water removal problems but have not yet reported any program for the early detection of potential failures...."	Physical logistics of some of the larger test equipment make them impractical for most power plant applications and the lack of a consistent ground plane makes testing for insulation resistance, high voltage and partial discharge ineffective.
18.	Background: "Even though there are only about a dozen cables susceptible for moisture-induced damage in a nuclear station, the staff identified 23 Licensee Event Reports (LERs) and morning reports since 1988 on failures of buried medium-voltage cables from insulation failure...."	In service failures need to be addressed separately from failures which occurred during maintenance. A cable that fails during a DC Hipot test when the equipment is in maintenance should be considered a success because the degraded cable was identified before it failed in service.

No.	Section	Comment
19.	Background: "...some cables are exposed to moisture from condensation and wetting in inaccessible locations such as buried conduits, cable trenches, cable troughs, duct banks, underground vaults and direct buried installations...."	The scope of the draft specifically includes inaccessible cables in conduit, cables exposed to condensation, and low voltage cable. This is too broad a scope and includes cables that will not be adversely affected by water.
20.	Background: "...some cables are exposed to moisture from condensation and wetting in inaccessible locations such as buried conduits, cable trenches, cable troughs, duct banks, underground vaults and direct buried installations...."	Most cables are designed to be installed in a wet environment.
21.	Background: "Most of these defects worsen gradually over time as insulation degradation leads to cable failure."	The assertion that most cable damage worsens over time is incorrect. The source of the damage, the type of damage and the application must all be considered when evaluating cable damage. The majority of cable damage that occurs within the power plant will not worsen over time, or lead to cable failure.
22.	Background: "Cables in these environments can fail due to various failure mechanisms such as water treeing (physical degradation), electrical treeing or other mechanisms of insulation degradation over varying voltage levels that decrease the dielectric strength of the conductor insulation."	The letter seems to imply that water treeing and electrical treeing is a concern for low voltage cable.
23.	Background: "When the staff observed that some of the cables qualified for 40 years through the equipment qualification program were also failing at several nuclear stations, a detailed review was conducted."	The cable qualification performed in accordance with IEEE 383 will not ensure that cables will perform in a submerged environment. The submergence requirements are demonstrated by testing performed to ICEA standards.
24.	Background: "the staff identified 23 Licensee Event Reports (LERs) and morning reports since 1988 on failures of buried medium-voltage cables from insulation failure. These reported events are believed to be only a very small fraction of the failures since not all cable failures are reportable."	There is no evidence that there is a generic issue with cables installed in a wet or submerged environment. The NRC inference is not founded. NEI data indicates that almost 70% of plants have had no cable failures due to submerged environments.

No.	Section	Comment
25.	Background: "In most of the reported cases, the failed cables were in service for 10 years or more and none of these cables were identified as designed or qualified for long-term wetting or submergence."	The generic letter states that none of the cables were designed or qualified for long-term wetting or submergence. If cables are designed for long term submergence is this adequate justification to disposition this issue with no further action required?
26.	Applicable regulatory Requirements: "However, the recent industry cable failure data indicates a trend in unanticipated failures of underground/inaccessible cables that are important to safety."	Mention is made of recent industry cable failure data, what is the source?
27.	Discussion: "Until isolated by a breaker, the fault current or transient voltages travel on the immediate power systems, trip breakers that operate near their trip setpoint and fail other degraded insulation systems...."	Again this depends on the design of the ground system (ungrounded, high resistance grounded or ground fault tripping).
28.	Discussion: "Potential cable failures can be detected through state-of-the-art techniques for measuring and trending the condition of cable insulation.... Selective use of testing techniques, such as the partial discharge test, time domain reflectometry, dissipation factor testing, very low frequency AC testing, and broadband impedance spectroscopy, have helped licensees assess the condition of cable insulation with reasonable confidence, such that cables can be replaced in a planned way during refueling outages...."	Diagnostic techniques that are currently available have limited applicability and may be controversial in that some engineers believe they should be used and others believe they deteriorate the cable to the point of premature failure. Some of the newer techniques (low frequency AC, PD, etc.) have not been used long enough to validate their effectiveness at early detection of potential failures or to validate that the tests do not cause premature failure. There is no consensus among the various industry experts on what tests to do for the various voltage classes and insulation types of cables in use and what acceptance criteria to use. Trending of megger readings, TDR or other types of tests may work in a laboratory under tightly controlled environmental conditions but is not effective in a real operating power plant. Additionally there are no baseline data for the installed cables for trending purpose.
29.	Discussion: "A diagnostic cable test program provides reasonable confidence that the cable will perform its intended function. The frequency of the test should be commensurate with the observed cable test results. To avoid unplanned outages and unanticipated failures, certain licensees have adopted a baseline frequency of 5 years for new cables or more frequent testing when insulation degradation is observed...."	There have been several attempts to get industry consensus for monitoring techniques: EPRI Report NP-7485 "Power Plant Practices to Ensure Cable Operability," EPRI Report TR-105581 "Improved Conventional Testing of Power Plant Cables," and a draft IEEE Standard (circulated in 2001 but never published) P1186/D10, Recommended Practices for the Evaluation of Installed Cable Systems for Class 1I Circuits in Nuclear Power Generating Stations. None of these have provided enough guidance and acceptance criteria to be beneficial in condition monitoring of cables.

No.	Section	Comment
30.	Discussion: "Although nuclear plant systems are designed against single failures, undetected degradation of cables due to pre-existing manufacturing defects or wetted environments of buried or inaccessible cables could result in multiple equipment failures."	Energizing a normally de-energized cable is not a common mode failure. There are no applications in which a cable or its associated component is never tested or maintained to ensure operability. For this scenario to be of concern it must be assumed that the overall condition of the equipment is unknown. Then if an accident occurs we will simply hope equipment will perform. This is not correct.
31.	Discussion: "As cables that are not qualified for wet environments are exposed to wet environments, they will continue to degrade with an increasing possibility ..."	If cables are qualified for wet or submerged environments can the position be taken that the cables are not adversely degrading overtime and further testing is not required?
32.	Discussion: "Those degraded cables that are normally energized may fail to reveal their degraded condition, and the potential failure of the de-energized safety systems might only be revealed during a demand for the mitigation capability."	This statement seems to be on both sides of the fence. Energized cables in a wet environment will not show the degradation that is occurring because they are energized. Non-energized cable will degrade because they are not energized.
33.	Discussion: "Certain licensees have attempted to periodically drain the accumulated water from the cable surroundings to avoid cable failures. In areas where the water table is relatively close to the cable, the water refills the cavity soon after the draining. In other cases, the water accumulates seasonally during snow fall or rain, filling the conduit or raceways, and cables may dry out whenever the humidity drops. In both cases, periodic draining may decrease the rate of insulation degradation but it does not prevent cable failures."	The letter indicates in several places that the cable failures can be attributed to installation misapplications. The following statement is correct only if the cable has been misapplied. If the cable is rated to perform in a submerged environment this should not be an issue.

No.	Section	Comment
34.	Discussion: "Potential cable failures can be detected through state-of-the-art techniques for measuring and trending the condition of cable insulation. The cables that are susceptible to moisture-induced failures may vary from plant to plant, and they are generally routed in underground conduits, concrete duct banks, cable trenches, cable troughs, underground vaults or direct buried installations. Selective use of testing techniques, such as the partial discharge test, time domain reflectometry, dissipation factor testing, very low frequency AC testing, and broadband impedance spectroscopy, have helped licensees assess the condition of cable insulation with reasonable confidence, ..."	The "state of the art" in cable testing is misrepresented. This statement implies that the cable condition can be determined with the use of various in-situ tests. I do not believe this to be the case.
35.	Discussion: "A diagnostic cable test program provides reasonable confidence that the cable will perform its intended function. The frequency of the test should be commensurate with the observed cable test results. To avoid unplanned outages and unanticipated failures, certain licensees have adopted a baseline frequency of 5 years for new cables or more frequent testing when insulation degradation is observed."	Is a diagnostic cable test program only recommended for cables not rated for submergence? The testing requirements detailed in the letter are only applicable if this is the case.
36.	Requested Information	Most of the information being requested has already been supplied to NEI.