

NRCREP Resource

From: John MacDonald [jmacdonald@istcorp.com]
Sent: Wednesday, September 03, 2008 6:43 PM
To: NRCREP Resource
Cc: jmacdonald@mirion.com; Satish Aggarwal; John.Disosway@dom.com; 'BURSTEIN Nissen M (AREVA NP INC)'
Subject: IEEE NPEC Comments on Draft Regulatory Guide DG-1132
Attachments: DG 1132 IEEE Response.doc

Dear Sir or Madam:

The IEEE Nuclear Power Engineering Committee (NPEC) had previously submitted comments to the NRC regarding DG-1132. For the ACRS meeting of 9-4-08, attached are supplemental comments to draft regulatory guide DG-1132 based on the NRC proposed changes to DG-1132. These comments were provided by the membership of NPEC Subcommittee 2, WG 2.4 that has responsibility for IEEE Standard relating to "Qualification of Safety-Related Cables and Field Splices for Nuclear Power Plants", IEEE Std. 383

Very truly yours,
John MacDonald
Vice-Chair,
IEEE Nuclear Power Engineering Committee

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S. Aggarwal (SK9)

IEEE Concerns with the Proposed Regulatory Guide 1.131

The following three items provide an IEEE response to the NRC resolution of comments for the proposed revision to Regulatory Guide 1.131, "Qualification of Safety-Related Cables and Field Splices for Nuclear Power Plants" (RG1.131). The IEEE is particularly concerned with the proposed regulatory positions discussed in Regulatory Positions 2 and 7. A comment is also made on the "Discussion" section.

Regulatory Position

- (2) Clause 6.1.2, "Coaxial, triaxial, and twinaxial cables," should be supplemented to include appropriate connections.

IEEE Specific Comment

"In addition, power and Instrumentation and control cables for which failures could disable risk - significant equipment should have condition monitoring programs to determine that the cables can perform their function when needed."

IEEE Comment: IEEE 383-2003 asserts that type testing is adequate to ensure that cable and field splices will perform their intended functions during and after a design basis event. The requirement to impose condition monitoring on a subset of Class I E electrical cables implies that qualifications by type testing is no longer adequate. This is inconsistent with the qualification philosophy contained within IEEE 323-2003 and its daughter standards.

The requirement for CM is also being imposed without any condition monitoring techniques being endorsed by IEEE 383-2003. The introduction of cable CM establishes a requirement for testing with no defined test methodology or acceptance criteria,

The recommended use of such cable CM programs is also inconsistent with prior NRC conclusions regarding cable condition monitoring. The technical assessment of Generic Safety Issue 168, determined that "typical I&C cable qualification test programs include numerous conservative practices that collectively provide a high level of confidence that the installed I&C cables will perform their intended functions during and following design-basis events, as required by Title 10, Section 50.49, (10 CFR 50.49), of the Code of Federal Regulations "Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants".

IEEE Recommendation: The requirement for condition monitoring of Class 1 E cables should be omitted from the "Discussion", Regulatory Positions 2(c) and 10.

NRC Resolution

1982, the staff concluded that: "...qualification is verification of design limited to demonstrating that the electric equipment is capable of performing its safety function

under significant environmental stresses resulting from design basis accidents to avoid common-mode failures.” This is consistent with IEEE Std 323-2003 (and its previous versions). In 1982, the staff further concluded that: “...the state-of-art preconditioning techniques are not capable of simulating all significant types of degradation. Consideration should be given to surveillance, testing and maintenance of selected equipment.”

The staff continues to believe that some kind of condition monitoring for cables must be incorporated in a maintenance program in a nuclear power plant. Testing of one prototype in a laboratory and then doing nothing for 40 years (or longer) does not provide a reasonable level of confidence in cable performance. Monitoring of environment conditions and radiation levels, and adopting some kind of technique for condition monitoring are the necessary steps to provide a reasonable level of confidence.

The guidance for condition monitoring of cables is limited to risk-significant cables.

Power cables that are routed underground should be capable of performing their function when subjected to anticipated environmental conditions such as moisture or flooding. This is consistent with Generic Letter GL 2007-1.

Note that Regulatory Position 10 was revised.

IEEE Resolution Response

The NRC resolution indicates that the primary concern is that cables could be installed and no action taken to ensure that the temperature and radiation levels used to establish qualification are bounding over the life of the plant. If no actions were taken then the environmental changes that could result from plant modifications, or an incorrect assessment of initial plant conditions, would not be identified nor evaluated. The IEEE concurs that actions should be taken to ensure that environmental parameters, are initially, and remain bounded by values used to establish qualification. The IEEE believes that monitoring of plant environmental conditions; walkdowns to determine “hotspots” and the establishment of a qualified life based on aging data are adequate to ensure that cables will remain environmentally qualified.

The IEEE position is consistent with NRC research efforts. In RIS 2003-09 this statement is made:

“Following the completion of the NRC research effort, the staff concluded that typical I&C cable qualification test programs include numerous conservative practices that collectively provide a high level of confidence that the installed I&C cables will perform their intended functions during and following design basis events as required by 10 CFR 50.49, “Environmental Qualification (EQ) of Electric Equipment Important to Safety for Nuclear Power Plants.” These conservative practices continue to support the current use of a single prototype during qualification testing and, therefore, a successful test provides a high level of confidence that these cables will be able to perform their safety functions

during and following a design basis event. However, cable LOCA test failures that occurred during the NRC-sponsored research program indicate that in certain cases the original margin and conservatism inherent in the qualification process have been reduced. Licensees have stated in a few cases that a reduction in margin can be addressed by monitoring operating service environments (temperature, radiation, and humidity) to ensure that operating conditions do not exceed the parameters that were assumed during qualification testing. In this regard, walkdowns to look for any visible signs of anomalies attributable to aging, with particular emphasis on localized adverse environments, coupled with the knowledge of the operating service environments, could be sufficient to ensure that qualification is maintained.”

The IEEE still maintains that the requirement for CM is being imposed without any condition monitoring techniques being endorsed by IEEE 383-2003. The introduction of cable CM establishes a requirement for testing with no defined test methodology or acceptance criteria. IEEE recommends that this requirement be removed.

Regulatory Position

(7) Programs for monitoring of environmental conditions (such as temperature, radiation levels), and condition monitoring should be implemented for power, instrumentation, and control cables whose failures could disable risk-significant equipment. Condition monitoring programs may include any appropriate technique, supplemented with walkdowns to look for visible signs of anomalies attributable to aging with particular emphasis on the identification of localized adverse environments or “hot spots.” For safety-related power cables, which are inaccessible or installed underground, appropriate inspection, testing and monitoring programs should be implemented to detect degradation.

IEEE Specific comment

Clause 6.1.2, "Coaxial, triaxial, and twinaxial," should also include specimens of identical materials and construction, and configuration should include connections.

IEEE comments: Clause 6.1.2 currently requires that test specimens use identical materials and unique construction features, including braid angle and shield filler materials. The test specimens must also meet the requirements of a "Representative Cable". To add identical constructions could be implied to mean that every coaxial cable (RG 6, 58, etc.) is tested. This will require test specimens for each and every cable variation offered by a manufacturer. Such a requirement is an unnecessary burden, inhibits the use of minor cable design changes, and is inconsistent with the qualification of other cable types. IEEE 383-2003 and current practice rely on testing of representative cables with identical materials and specific characteristics but do not require identical constructions.

IEEE also disagrees that the coaxial, triaxial, and twinaxial test specimens include connections. IEEE 383-2003 specifically removed connections from its scope. Connectors are now addressed in IEEE Std. 572. The requirement to test cable and connectors could also be interpreted as qualifying a "matched set". This could further lead to the interpretation that every variation of cable and connector must be type tested. It should also be noted that IEEE 383-2003 now requires that coaxial, triaxial, and twinaxial cable be tested with their jacket to ensure that Jacket integrity is maintained. This is intended to ensure that jacket integrity is maintained for qualified connectors and splices that rely on said performance.

IEEE recommendation: Delete Regulatory Position 3.

NRC Resolution

Regulatory Position was modified (See staff's response to NUGEQ comment below on page 8).

IEEE Resolution Response

The IEEE continues to maintain that a specific requirement to include connectors is not warranted. IEEE 383-2003, section 6.1.2, provides the following statement:

Thermal and steam effects during DBE simulations may cause differential shrinkage or expansion of concentric cable layers in coaxial and triaxial cable with the potential for conductor shorting or loss of critical dielectric characteristics. Suitable test specimen lengths and configurations shall be included in the DBE test to evaluate this potential failure mode."

As currently stated the affects of differential shrinkage are required to be evaluated. This may or may not require the use of a connector. However, the responsibility for determining an acceptable test configuration rests with the manufacturer and test facility. If the NRC requires the use of a connector for this purpose, the inclusion of the connector may be interpreted as adequate to address the issue with no further evaluation.

The staff has also stated in the resolution:

"It was the staff's intention to couple these specialty cables with their connectors in the cable qualification program"

This statement continues to reinforce that cables will be qualified as "mated pairs". This has the potential to be interpreted, as every cable/connector combination will need to be qualified by test.

Discussion

IEEE Specific Comment

Clause 3.3, "Representative Cable," of IEEE Std 383-2003 should be supplemented with a description of conductor type (material, strand, and strand type) and also differentiate between conductor shield, insulation shield, and overall static shield.

IEEE Comment, The IEEE is not aware of any research, qualification test, or experience information suggesting that conductor material, strand, and strand type can affect qualification results of the cable's performance during DBE testing. Since this change is being recommended to the definition of "representative cable" this could lead to the interpretation that any change in the conductor material, strand, and strand type would have to be qualified. The requirement to include additional test samples for a change that does not impact qualification is not warranted and will add an unnecessary complexity to the qualification process.

IEEE Recommendation: Delete regulatory position 1.

NRC Resolution

Regulatory Position 1 was modified to reflect staff's intent.

IEEE Resolution Response

The IEEE concurs with the deletion of Regulatory Position 1, as it was previously stated. The following statement has been added to Section B, "Discussion". The reference to Regulatory Position 1 should be deleted. The scope of the position has been changed.

~~"An exact description of the "representative" cable is required for an adequate engineering analysis of later "modified" cables. The intent of this Regulatory Position 1 is to ensure that sufficient information is available for the "representative" cable to be able to extrapolate the conclusion from the results of the type tested cable to other cables claimed to be "represented" by the type test."~~