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IEEE POWER ENGINEERING SOCIETY  
NUCLEAR POWER ENGINEERING COMMITTEE

**CHAIR**  
J. Scott Malcolm  
AECL  
2251 Speakman Drive  
Mississauga, Ontario  
L5K 1B2 Canada  
VOX: 905 823-8040 / FAX 905 403-7301  
MalcolmS@AECL.CA

**VICE-CHAIR**  
John D. MacDonald  
IST-Conax Nuclear, Inc.  
402 Sonwil Drive  
Buffalo, NY 14225 USA  
VOX: 716 881-1073 / FAX: 716 681-1130  
j.d.macdonald@ieee.org

**SECRETARY**  
Satish K. Aggarwal  
U.S. Nuclear Regulatory Commission  
11545 Rockville Pike  
Rockville, MD 20852 USA  
VOX: 301 415-0005 / FAX: 301 415-5074  
SKA@NRC.gov

**PAST CHAIR**  
John J. Disoway  
Dominion-North Anna Power Station  
P O Box 402  
Mineral, VA 23117-USA  
VOX: 540 804-2588/Fax: 540 894-2178  
john\_disoway@dom.com

**Sub-Committee Chairs**  
**SC-1 Qualification**  
Nisesh Burstein  
AREVA NP, Inc.  
3315 Old Forest Road  
Lynchburg, VA 24506 USA  
VOX: 434 832-2501 / FAX: 434 832-2683  
nbur@ieee.org

**SC-3 Operations, Surveillance and Testing**  
George Ballasi  
General Dynamics  
Electric Boat Corporation  
75 Pierson Point Road  
Groton, CT 06340 USA  
VOX: 860 433-3389 / FAX: 860 433-1190  
gballasi@gb.com

**SC-4 Auxiliary Power**  
Harvey Lesko  
Arizona Public Service - Palo Verde NPS  
PO Box 52034, MS 7588  
Phoenix, AZ 85072-2034 USA  
VOX: 623 393-6986 / FAX: 623 393-6249  
h.lesko@azps.com

**SC-5 Human Factors, Control Facilities and Reliability**  
Stephen Floger  
Science Application International Corp.  
1710 BAIC Drive, MS T-1-12-3  
McLean, VA 20170 USA  
VOX: 202 493-3378 / FAX 202 493-3390  
sfloger@SAIC.com

**SC-6 Safety Related Systems**  
Michael Miller  
Duke Energy - Oconee Nuclear Station  
7800 Rochester Highway  
Senoeca, SC 29672 USA  
VOX: 864 885-4411 / FAX: 864 885-4173  
mmiller@duke-energy.com

**Standards Coordinator**  
Paul L. Yanosy, Sr.  
Westinghouse Electric, Co.  
4350 Northern Pike  
Moorestville, PA 15146 USA  
VOX: 412 374-6402 / FAX: 412 374-6458  
paul.l.yanosy@wes.westinghouse.com

**Awards Chair**  
Daniel F. Bruman  
PG&E Dinblo Canyon PP  
P.O. Box 56  
Avila Beach, CA 93424 USA  
VOX: 805 545-6646 / FAX: 805 545-6515  
dbr@ieee.com

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Rulemaking, Directives and Editing Branch  
Office of Administration  
U.S. Nuclear Regulatory Commission  
Washington, DC 20555-0001

Subject: Comments on Draft Regulatory Guide DG-1132  
"Qualification of Safety-Related Cables and Field Splices  
for Nuclear Power Plants"

Dear Sir or Madam:

The attached comments of draft regulatory guide DG-1132 are submitted by the IEEE Nuclear Power Engineering Committee (NPEC). These comments were provided by the membership of NPEC Sub-committee 2 (SC-2) that has responsibility for IEEE Standards relating to Equipment Qualification for Nuclear Power Generating Stations. The comments have been reviewed and approved by AdCom, the governing body of NPEC, and as such represent a consensus position of NPEC.

As noted, these comments are the consensus position of the Nuclear Power Engineering Committee. For follow-up or questions, please contact Mr. Nissen Burstein, Chair of SC-2, at 434-832-2501, or by e-mail to nissen.burstein@areva.com

Very truly yours,

*Scott Malcolm*

J. Scott Malcolm  
Chair, Nuclear Power Engineering Committee

cc: J. D. MacDonald, NPEC Vice-Chair  
S. K. Aggarwal, NPEC Secretary  
N. Burstein, Sub-Committee 2 Chair  
J. White, SC 2.4 Chair

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## B. Discussion

*"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 1E electrical cables implies that qualification 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 1E cables should be omitted from the "Discussion", Regulatory Positions 2(c) and 10.

### Regulatory Position 1

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

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"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.

### Regulatory Position 2

Clause 4, "Principal Qualification Criteria," should be supplemented as follows:

- (a) the documentation should include the cable or field splice's specification and qualification plan;
- (b) the documentation should include manufacturer's inspection and maintenance requirements to maintain and demonstrate continued qualification throughout its qualified life.
- (c) a condition monitoring program should also be implemented.

IEEE Comment: The information required with items (a) and (b) is currently required. Clause 4 currently requires that the documentation used to demonstrate qualification includes:

- The cable or field splice's specification or qualification plan
- Inspection and maintenance requirements
- Summaries and conclusions

See previous comments on cable condition monitoring.

IEEE recommendation: Delete Regulatory Position 2.

### Regulatory Position 3

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

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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.

#### Regulatory Position 7

Cause 6.3, "Age-conditioning" should be supplemented to include aged cable specimen and new splice kits; and a new splice kit combining an aged cable with a new cable.

IEEE comment: It is believed that the requirement to combine in a new cable splice with an aged cable is intended to demonstrate that the aged cable will not adversely affect the splice. This test configuration is not considered relevant to future qualification tests performed in accordance with IEEE 383-2003. IEEE 383-2003 requires that a 20 X diameter mandrel bend test be performed after normal environment thermal and radiation aging. This test demonstrates the cable jacketing material will retain some flexibility at the end of its qualified life. This effectively precludes installing splices onto embrittled cables within their specified qualified life. IEEE 383-1974 did not require this test if a similar 40 X diameter mandrel bend test was performed after the accident exposure. The requirement for the mandrel bend test after thermal and radiation aging is an enhancement to the qualification type test defined in IEEE 383-2003.

IEEE Recommendation: Delete Regulatory Position 7.

#### Regulatory Position 8

Clause 6.4.5, "Retained Flexibility," should be supplemented to include the following:

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**"The acceptance criteria for instrument cables should specify the minimum acceptable insulation resistance and signal attenuation limits".**

**IEEE Comment:** The mandrel bend tests are intended to test the integrity of the cable not establish a suitable level of electrical performance for specific instruments. The acceptable performance of an instrument cable during a DBE is an installation specific evaluation which is dependent on device type and cannot be determined by the cable manufacturer or the test lab.

**IEEE Recommendation:** Delete Regulatory Position 8.