

May 18, 2000

Mr. Ralph Beedle  
Senior Vice President and Chief Nuclear Officer  
Nuclear Energy Institute  
1776 I Street, N.W., Suite 400  
Washington, D.C. 20006-3708

Dear Mr. Beedle:

Brookhaven National Laboratories (BNL), under contract to the NRC, has been conducting research on low-voltage instrumentation and control cables (I&C) to support the resolution of Generic Safety Issue 168, "Environment Qualification of Electric Equipment." As part of this research, in late 1999, a loss-of-coolant accident (LOCA) test was conducted on I&C cables with ethylene propylene rubber (EPR) insulation and bonded chlorosulfonated polyethylene (CSPE) outer jackets (Test #5). The purpose of the test was to determine if cables with bonded jackets have a unique failure mechanism that is not present in unbonded jacketed cables under postulated LOCA conditions. The testing was performed at Wyle Laboratories in Huntsville, Alabama, on cable samples from several manufacturers including Okonite.

The test subjected the following Okonite cable to accelerated thermal and radiation aging and then exposed the cable samples to LOCA conditions:

- EPR insulation with bonded CSPE jacket; single-conductor; #12 American wire gage (AWG)

The following accelerated aging parameters were selected on the basis of Okonite's original test report for 40-year qualification:

- 504 hrs. @ 302 °F followed by 50 Mrads @ 0.65 Mrad/hr.

The LOCA test consisted of exposure to 150 Mrads of gamma radiation at a dose rate of 0.75 Mrad/hr. followed by exposure to a double-peak steam profile, as described in IEEE Std. 323-1974. The peak conditions of the steam profile were 346 °F and 113 psig. A boric acid-based chemical spray was initiated when the test chamber pressure had reached 32 psig and was continued for 24 hours. The duration of the steam exposure was 10 days. Following the LOCA exposure, submerged voltage withstand tests were performed on the specimens at a test voltage of 2400 volts ac (equivalent to 80v/mil ac) as described in IEEE Std. 383-1974. All three of the Okonite specimens aged to an equivalent of 40 years, and one of the two Okonite specimens, aged to an equivalent of 20 years, failed instantaneously. The artificial aging apparently contributed to the failure mechanism since circumferential cracks were observed following pre-aging. Longitudinal splits were observed on the cable jacket following LOCA exposure. The enclosed BNL Report contains a summary of the results of LOCA Test #5.

Discussions and meetings with representatives from Okonite and industry on February 8, and 16, 2000, respectively, determined that the composite EPR with CSPE jacket in Okonite test report NQRN-1A is a bonded jacket system, similar to the BNL specimens. It is NRC's

understanding that Okonite EPR insulation with bonded CSPE jacket, single-conductor, #12 AWG cables can be used in electric equipment important to safety located in harsh environment areas of nuclear power plants. Okonite test report NQRN-1 is the basis for environmental qualification of this cable under 10 CFR 50.49 "Environmental Qualification of Electric Equipment Important to Safety for Nuclear Power Plants."

These test results call into question the qualification of record for Okonite single conductor cable with EPR insulation and bonded CSPE jacketing as required by 10 CFR 50.49. In this regard, NRC has forwarded a letter to The Okonite Company providing a copy of the attached test report for their review pursuant to 10 CFR Part 21 (copy enclosed). As indicated above, this information was also shared publicly in meetings on February 8 and 16, 2000. It is NRC's understanding that because the subject cabling is single conductor, its application in safety-related applications where it may be subject to harsh environments may be limited. It is also recognized that the pre-aging parameters and accident profiles used in the qualification tests are probably conservative relative to actual conditions where this cabling may be installed. However, information on the exact applications of the subject cabling is not readily available to the NRC. Thus it is difficult for us to completely assess the plant risk associated with use of this type of cable. Also, we don't know to what extent licensees have already assessed this subject or plan to assess it for their facilities. Therefore, we would like to schedule a meeting to discuss possible options for addressing this issue. Accordingly, I am requesting that your staff contact Joseph Birmingham, of my staff, at (301) 415-2829 to schedule a public meeting in the near future to discuss this subject. I appreciate your cooperation on this subject.

Sincerely,

Samuel J. Collins, Director **/RA by B. Sheron for//**  
Office of Nuclear Reactor Regulation

Attachment: Results of Test #5 on Bonded Jacket Electric Cables, dated March 6, 2000

cc: Mr. Arthur Pack, Jr., Okonite Company

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Mr. Ralph Beedle

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