UNITED STATES OF AMERICA NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of) Docket Nos	50-275 OLA
PACIFIC GAS AND ELECTRIC COMPANY)	50-323 OLA
(Diablo Canyon Nuclear Power Plant, Units 1 and 2)) (Construction Period Recovery)	

AFFIDAVIT OF ANN M. DUMMER IN SUPPORT OF NRC STAFF RESPONSE TO SAN LUIS OBISPO MOTHERS FOR PEACE'S MOTION FOR LEAVE TO FILE ADDITIONAL DISCOVERY RE: OKONITE CABLES WITH BONDED JACKETS

1, Ann M. Dummer, first being duly sworn, depose and state:

9305110214 930

ADOCK 05000275

PDR

 My name is Ann M. Dummer. I am employed by the Nuclear Regulatory Commission as a reactor systems engineer in the Plant Systems Branch of the Office of Nuclear Reactor Regulation.

2. Since August 1992, I have worked with environmental qualification issues, and, as relevant here, with issues raised in Information Notice 92-81, "Potential Deficiency of Electrical Cables with Bonded Hypalon Jackets," which I co-authored.

3. I have been asked to address San Luis Obispo Mothers for Peace's Motion for Leave to File Additional Discovery Re: Okonite Cables with Bonded Jackets, dated April 2, 1993, in light of Information Notice 92-81 and of the NRC Staff's review of the matter that was the subject of Board Notification 93-08 regarding an allegation of cable degradation at Diablo Canyon. 4. In its motion, San Luis Obispo Mothers for Peace states that certain documents, including Information Notice 92-81, demonstrate that PG&E is experiencing some maintenance problems at Diablo Canyon involving the degradation of Okonite cables and possibly other cables with bonded jackets. Motion at 1. Although the cables addressed in Information Notice 92-81 and the cables of concern at Diablo are all manufactured by Okonite, they are different cables exhibiting different failure modes.

5. The cables that failed at Diablo Canyon are 12kV and 4kV power cables. These cables have EPR insulation, shielding, and a neoprene jacket (Figure 1). They do not have a bonded jacket. The 12kV cables that failed were severely degraded, apparently as a result of chemical attack. The 4kV cables were not degraded and may have failed due to a manufacturing defect. The 12kV cables are not used in any safetyrelated application at Diablo Canyon. They are not required to be environmentally qualified. The licensee has on-line fault detection capability for these cables. All failed cables have been replaced, and a number of undamaged cables in the same location have also been replaced as a result of the failures. The licensee has not yet completed a root cause analysis for the failure of these cables.

6. The cable failures discussed in documents 1-4 (Information Notice 92-81 and other NRC documents) occurred during testing conducted by Sandia National Laboratories. These cables are small instrumentation and control cables that have one layer of EPR insulation with a hypalon jacket bonded to the insulation (Figure 2). These cables failed during laboratory testing similar to that required for environmental qualification of cables. They had been artificially aged at a high temperature, exposed

- 2 -

to radiation, and subjected to a simulated accident environment. The failures at Sandia were different from the Diablo Canyon failures because at Sandia the insulation split open from one end of the cable to the other, as if someone had cut the cable open with a knife. These failures appear to be mechanical in nature, resulting from the embrittlement of the hypalon jacket due to thermal aging. The NRC's concern with these Okonite cables is that these cables were never tested for qualification with the bonded jacket in place. The test failures may indicate that some installed cables may not be adequately qualified to perform their safety-related function during a design-basis event. The NRC has informed the industry of these test failures, but the industry, including Diablo Canyon, has not been required to take any action.

7. San Luis Obispo Mothers for Peace, in its motion, attempts to tie the failures at Diablo Canyon to the failures described in the Information Notice. The cables are different sizes and of different construction, and are used in different applications. The failure mechanisms are also different. The Diablo Canyon cables are not environmentally qualified and do not have bonded jackets. Therefore, the information notice is not relevant to the recent cable failures at Diablo Canyon.

- 3 -

Ann M. Dummer

 The matters stated above are true and correct to the best of my knowledge and belief.

ann M Dummer

Ann M. Dummer

Subscribed and sworn to before me this 21st day of April 1993

Mª Anald

Notary Public

My commission expires: December 1, 1993



FIGUREZ.

Product Data Section 3: Sheet 1

Okonite Okolon Type RHH, RHW, USE, FR-1

600V Power and Control Cable Copper Conductor/90C Dry/75C Wet For Cable Tray Use

Composite Insulation

Okonite-Okolon is Okonite's trade name for its ethylene propylene, chlorosulfonated polyethylene composite insulation. The combination of the two materials provides a dielectric which requires no outer covering and which has excellent resistance to heat, mechanical abuse, flame, weathening, most oils, acids and alkalies.

Applications

Okonite-Okolon 600 Volt Power and Control Cables are recommended for use in all low voltage circuits where continuity of service is the prime consideration. They can be installed in conduit, underground ducts, approved raceways, direct burial, and in cable tray (size 250 kcmil and larger).

Specifications

Conductors: Coated, stranded copper conductor per ASTM B-8 and B-189. insulation. Meets or exceeds all requirements of ICEA S-68-516, NEMA WC-8 and UL Standards 44 and 854. Listed by Underwriters Laboratories. Inc. as Type RHH or RHW, USE, VW-1

(formerly FR-1). Sizes 250 kcmil and larger are also marked "Sunlight resistant, for use in cable tray".

Product Features

- · Extreme heat resistance
- 90C continuous reting
- 110C hot spot rating
- 130C amergency overload rating 250C short circuit rating
- Exceptional resistance to deformation
- at high temperature
- · Stable electrical p. poerties
- . Low SiC and power factor
- Low moisture absorption
- · Mechanically rupped
- · Resistant to weather, most oils, acids and alkalies
- · Smaller diameter than RHW-jacketed cables
- · More flexible, easier to install,
- terminate or splice than XLPE insulation.
- Passes IEEE 383 flame test
- · Flame retardant
- · UL Listed
- · OSHA acceptable

Additional Information

For additional information contact your local Okonite representative or Service Center Manager.



ATTACHMENT I

PROFESSIONAL QUALIFICATIONS

ANN M. DUMMER

- ORGANIZATION: Division of Systems Safety and Analysis Office of Nuclear Reactor Regulation
- TITLE: Reactor Systems Engineer Plant Systems Branch
- EDUCATION: B.S. Mechanical Engineering, Colorado State University

Graduate work in Mechanical Engineering, University of Maryland

EXPERIENCE:

- 1992 Present Nuclear Regulatory Commission, Reactor Systems Engineer in Plant Systems Branch. She has worked with Environmental Qualification issues since joining this branch in August 1992.
- 1990 1992 Nuclear Regulatory Commission, Reactor Engineer Intern working in the Vendor Inspection Branch, Plant Systems Branch, Project Directorate V of Nuclear Reactor Regulation, Division of Reactor Projects of Region IV, and in the Severe Accident Issues Branch of Office of Nuclear Reactor Research.
- PUBLICATIONS: Co-author of Information Notice 92-81, "Potential Deficiency of Electrical Cables with Bonded Hypalon Jackets," December 11, 1992.

UNITED STATES OF AMERICA NUCLEAR REGULATORY COMMISSION

'93 MAY -4 P3:03

DOLKE LED USNRC

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of PACIFIC GAS & ELECTRIC CO.)) Docket Nos.)	50-275 OLA-2 50-323 OLA-2	
(Diablo Canyon Nuclear Power Plant, Units 1 and 2)) (Construction)	Period Recovery)	

CERTIFICATE OF SERVICE

I hereby certify that copies of "NRC STAFF'S RESPONSE TO SAN LUIS OBISPO MOTHERS FOR PEACE THIRD LATE-FILED CONTENTION" in the above captioned proceeding have been served on the following by deposit in the United States mail, first class or, as indicated by an asterisk, by deposit in the Nuclear Regulatory Commission's internal mail system this 4th day of May 1993:

Charles Bechhoefer* Administrative Judge Atomic Safety and Licensing Board Mail Stop: EW-439 U.S. Nuclear Regulatory Commission Washington, DC 20555

Jerry R. Kline* Administrative Judge Atomic Safety and Licensing Board Mail Stop: EW-439 U.S. Nuclear Regulatory Commission Washington, DC 20555

Frederick J. Shon* Administrative Judge Atomic Safety and Licensing Board Mail Stop: EW-439 U.S. Nuclear Regulatory Commission Washington, DC 20555 Office of Commission Appellate Adjudication* Mail Stop: 16-G-15 OWFN U.S. Nuclear Regulatory Commission Washington, DC 20555

Adjudicatory File* (2)
Atomic Safety and Licensing Board Panel
Mail Stop: EW-439
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Atomic Safety and Licensing Board Panel* Mail Stop: EW-439 U.S. Nuclear Regulatory Commission Washington, DC 20555 Nancy Culver, President San Luis Obispo Mothers for Peace P.O. Box 164 Pismo Beach, CA 93448

Christopher J. Warner Richard F. Locke Pacific Gas & Electric Co. 77 Beale Street San Franciso, CA 94106

Office of the Secretary* (2) Attn: Docketing and Service Mail Stop: 16-G-15 OWFN U.S. Nuclear Regulatory Commission Washington, DC 20555 Joseph B. Knotts, Jr., Esq. David A. Repka, Esq. Kathryn M. Kalowsky, Esq. Winston & Strawn 1400 L Street, N.W. Washington, DC 20005-3502

Truman Burns Robert Kinosian California Public Utilities Commission 505 Van Ness, Room 4103 San Francisco, CA 94102

dalar Anh P. Hodgdon

Counsel for NRC Staff

Directors

DISTRIBUTION T. Murley F. Miraglia W. Russell S. Varga W. Travers J. Calvo J. Partlow G. Lainas J. Zwolinski M. Virgilio S. Varga J. Roe J. Wiggins, R:1 W. Lanning, R:I J. Johnson. R:II E. Merschoff. R:II W. Forney, R:III T. Martin, R:III T. Gwynn, R:IV D. Chamberlain, R:IV K. Perkins, R:V Project Directorates I-V G. Hubbard SPLB File A. Thadani



NUCLEAR REGULATORY COMMISSION

January 27, 1993

MEMORANDUM FOR: Steven A. Varga, Director Division of Reactor Projects 1/II, NRR

> Jack W. Roe, Director Division of Reactor Projects III/IV/V, NRR

William D. Travers, Deputy Associate Director for Advanced Reactors and License Renewal, NRR

FROM: Ashok C. Thadani, Director Division of Systems Safety and Analysis, NRR

SUBJECT: STAFF ACTIONS FOR THE RESOLUTION OF A POTENTIAL DEFICIENCY IN THE ENVIRONMENTAL QUALIFICATION OF BONDED-JACKET CABLES

The purpose of this memorandum is to inform you of recent developments regarding failures of Okonite and other bonded-jacket electrical cables. As discussed in recent Director's Highlights, cable failures during testing conducted by Sandia National Laboratories have identified a potential deficiency in that bonded-jacket cables have a potential for failure during a LOCA before 40 years, if these cables are used at temperatures greater than 50 °C (122 °F).

Based on the results of the Sandia testing and reviews of environmental qualification test reports, Information Notice (IN) 92-81: "Potential Deficiency of Electrical Cables with Bonded Hypalon Jackets" (Enclosure 1) was issued on December 11, 1992, to inform licensees of the staff's concerns related to the use of bonded-jacket cables at temperatures greater than 50 °C (122 °F). Additionally a memorandum, subject, "Failures of Okonite Electrical Cables with Bonded Hypalon Jacket During Tests Performed by Sandia National Laboratories," dated December 10, 1992 (Enclosure 2), was sent to the Commission. This memorandum discussed safety concerns and planned actions regarding this issue.

The Plant Systems Branch has been assigned the lead for this issue and has developed a preliminary task action plan outline (Enclosure 3). It should be noted that the dates and activities are subject to change as information is obtained and a detailed action plan is developed.

While the staff has determined that there is no immediate safety concern, the staff is evaluating the long term safety significance of this potential deficiency. In its evaluation, the staff will include any information obtained from the licensees which may have been developed in response to IN 92-81. In particular, this information may be developed when licensees take any necessary actions described in Generic Letter 88-07, "Modified Enforcement Policy Relating to 10 CFR 50.49, 'Environmental Qualification of

Electrical Equipment Important to Safety for Nuclear Power Plants,'" if the licensees determine they have the potential deficiency described in the IN.

As part of this evaluation and in accordance with the letter to the Commission, a letter identifying the concerns has been sent to NUMARC (Enclosure 4). In addition, the letter seeks to determine if NUMARC is interested in assisting industry in resolving the concerns identified in the IN. Suggested areas where NUMARC could assist industry were (1) coordinating the collection of information that identifies where bonded-jacket cables are used in nuclear plants and their installed environmental conditions and (2) developing and coordinating a licensee inspection effort to determine the material condition of installed bonded-jacket cables. NUMARC has not yet responded to the staff's letter.

While the staff plans to work with NUMARC as the industry focal point on this issue, we are also taking steps to issue a Generic Letter, if it is needed, as a method to obtain information to ascertain the long term safety significance of this issue. In order to provide background information for the Generic Letter, assistance from NRR Projects and Regions may be requested. If assistance is required, Projects and/or Regions will be contacted as appropriate.

If there are questions about this issue, contact George Hubbard at 504-2870.

: Distaban

AcAshok C. Thadani, Director Division of Systems Safety and Analysis Office of Nuclear Reactor Regulation

Enclosures: As stated

cc w/enclosures: W. Russell J. Partlow

*See previous concurrences.

SPLB:DSSA	SPLB:DSSA
GHubbard; cf*	CMcCracken*
12/29/92	12/29/92

[G:\CABLES\OKACTION.GTH]

AThadani 1/27/93

UNITED STATES NUCLEAR REGULATORY COMMISSION OFFICE OF NUCLEAR REACTOR REGULATION WASHINGTON, D.C. 20555

December 11, 1992

NRC INFORMATION NOTICE 92-81: POTENTIAL DEFICIENCY OF ELECTRICAL CABLES WITH

Addressees

All holders of operating licenses or construction permits for nuclear power reactors.

The U.S. Nuclear Regulatory Commission (NRC) is issuing this information notice to alert accressees to a potential deficiency in the environmental cualification of electrical cables with bonded Hypaion jackets. It is expected that recipients will review the information for applicability to their facilities and consider actions, as appropriate. However, suggestions contained in this information notice are not NRC requirements; therefore, no specific action or written response to this notice is required.

Description of Circumstances

Sandia National Laboratories (SNL), under contract to NRC, has been conducting tests on cables manufactured by three different manufacturers, including Ckonite. The tests were performed to determine the minimum insulation inickness necessary for installed cable to perform its intended function incuid the insulation be damaged during installation, maintenance, or other activities. Therefore, the thermal and radiation aging and loss-of-coolantaccident (LOCA) testing for the cables were performed with reduced and full insulation thicknesses. The Okonite specimens tested were single-conductor. 500-voit. 12 American Wire Gauge (AWG) control cables insulated with ethylere propylene rubber (EPR) with a bonded Hypalon jacket (Okonite-Okolon). During -OCA testing, all 10 of the Okonite-Okolon cable samples failed. The other caples in this test program did not have bonded jackets and did not experience unexpected failures.

Curing this test program, the cables were first subjected to 130 megarads of radiation at the rate of 300 kilorads per hour for 433 hours and were then thermaily aged at 158 °C (316 °F) for 336 hours. Based on the Arrhenius equation, accelerated thermal aging at this time and temperature is equivalent to a 40-year cable life at 69 °C (156 °F) for the jacket and 76 °C (169 °F) for the insulation. After thermal aging, through-wall cracks were noted on most of the Okonite-Okoion cables. However, the cracks did not prevent the

9212070135

IN 92-81 December 11, 1992 Page 2 of 3

caples from passing an insulation resistance (IR) test that was conducted in a cry environment.

After the aging and IR tests, the cables were subjected to a LOCA test. The test sequence was (1) 94 hours of testing to simulate the LOCA environment befined in Appendix A to Institute of Electrical and Electronics Engineers (IEEE) Standard 323-1974, "IEEE Standard for Qualifying Class IE Equipment for Muclear Power Generating Stations," and (2) 146 hours at 121 °C (250 °F) for the remainder of the test. No chemical spray was used. The cables were energized by 110-volt DC power during the test with no load. One cable with full insulation thickness failed just after the test chamber conditions became saturated at 11-1/2 hours into the test. By the fifth day of the test, all the Okonite cables had failed, as indicated by blown 1-ampere fuses. The test champer was opened on October 24, 1992, and the cables were visually inspected. The insulation and jacket on the Okonite cables had split down the length of the cable, and bare conductor was visible.

On October 28, 1992, the NRC staff visited SNL to evaluate the test failures. During that visit, SNL personnel informed the staff that other Okonite cables with bonded Hypalon jackets had failed similarly at SNL under another NRCsponsored test program (license renewal test program). For this test, the cables were thermally aged to the equivalent of a 40-year life at 56 °C (133 °F). One out of four Okonite-Okolon cables failed during LOCA testing. Another group of Okonite cables that had been aged to a 40-year life at 50 °C (122 "F) passed this testing.

In addition to the Okonite failures in the license renewal test program, cables manufactured by Samuel Moore also failed during LOCA testing. These cables were Dekoron Dekorad Type 1952, two-conductor, twisted, shielded pair, 15 AWG instrument cables covered with ethylene-propylene diene monomer (a type of EPR) insulation with a bonded Hypalon jacket and an overall jacket of -ypaion. One cable in which one conductor failed had been thermally aged to a 10-year life at 55 °C (131 °F), while the other caple in which both conductors failed had been thermally aged to a 40-year life at 56 °C (133 °F). These failures were similar to the failure of the Okonite-Okoion cable in that the insulation and bonded jacket had split open. Other samples of Samuel Moore caple survived aging and accident testing under similar conditions.

Discussion

The SNL test results from NRC-sponsored programs raise questions with respect to the environmental qualification of Okonite cables with bonded Hypalon cackets that have not been specifically qualified for service conditions exceeding 50 °C (122 °F) for 40 years. The staff reviewed the qualification cata ceveloped by the Okonite Company and noted that Okonite 2 kV cables with .76 mm [30 mil] bonded Hypalon jackets and 600-volt cables with unjacketed EPR insulation were previously tested. The 600-volt cables with 0.38 mm [15 mil] bonded Hypalon jackets were qualified based on the previous 2 kV and 600oit test results. It was believed that if the unjacketed EPR insulation cassed qualification testing, then EPR insulation with a bonded jacket would

IN 92-81 Decemper 11, 1992 Page 3 of 3

also pass qualification testing. However, the Sandia test results indicate that Okonite cable with bonded Hypalon jackets may be susceptible to failure.

The qualification data reviewed by the staff for the Samuel Moore cables showed that cables with bonded Hypalon jackets had been previously tested by Isomedix, Inc. The tests documented qualification of the Dekoron Dekorad cable to a qualified life of 40 years at plant service conditions of 52 °C (126 °F) or less. The test results from the license renewal test program at SNL raise questions about the qualification of Samuel Moore Dekoron Dekorad Type 1952 cables when used at higher temperatures.

Other bonded-jacket cables, qualified for up to 90 °C (194 °F) applications as claimed by various vendors, may be susceptible to the same type of failures if not specifically tested in the bonded confirguration. The difference in aging rates between the jacket and the insulation may be a factor in the failure of conced-jacket caples. Therefore, cualification testing that does not use the Cacketed configuration may not be representative of actual cable performance.

Decencing on the application, failure of these cables could affect the performance of safety functions in nuclear power plants. The functional integrity of the cables could be affected if the cables are used inside containment, used in continuous power circuits, routed with power cables, or routed close to hot pipes. Generic Letter 88-07, "Modified Enforcement Policy Relating to 10 CFR 50.49, 'Environmental Qualification of Electrical Equipment Important to Safety for Nuclear Power Plants,'" provides relevant information on dealing with potential environmental qualification deficiencies.

This information notice requires no specific action or written response. If you have any questions about the information in this notice, please contact the of the technical contacts listed below or the appropriate Office of Suclear Reactor Regulation (NRR) project manager.

Brian K. Grimes, Director Division of Operating Reactor Support Office of Nuclear Reactor Regulation

Hukam C. Garg, NRR Technical contacts: (301) 504-2929

> Ann M. Dummer, NRR (301) 504-2831

Ettachment: List of Recently Issued NRC Information Notices

Contraction and the second sec

NUCLEAR REGULATORY COMMISSION

December 10, 1992

MEMORANDUM FOR: The Chairman Commissioner Rogers Commissioner Curtiss Commissioner Remick Commissioner de Planque FROM: James M. Taylor Executive Director for Operations

SUBJECT:

FAILURES OF OKONITE ELECTRICAL CABLES WITH BONDED HYPALON JACKET DURING TESTS PERFORMED BY SANDIA NATIONAL LABORATORIES

The purpose of this memorandum is to provide early notification to the Commission of an emerging issue which the staff is pursuing concerning a potential deficiency in the environmental qualification of electrical cables with bonded jackets.

During testing conducted by Sandia National Laboratories. Okonite electrical During testing conducted by Sandia National Laboratories. Okonite electrical cables with ethylene propylene rubber (EPR) insulation and a bonded Hypalon (chlorosulfonated polyethylene. CSPE) jacket cracked during accelerated aging (chlorosulfonated polyethylene. The specific failures appear to be related and did not survive the LOCA test. The specific failures appear to be related in the interface between the bonded Hypalon jacket and the cable insulation. to the interface between the bonded Hypalon jacket and the cable insulation. The cables had been aged at 158 °C (316 °F) for 336 hours to simulate 40 years The cables had been aged at 158 °C (316 °F). Other Okonite cable test samples that were of plant life at 69 °C (156 °F). Other Okonite cable test samples that were of plant life at 69 °C (212 °F) for 6 months to simulate 40 years of plant life at aged at 100 °C (212 °F) for 6 months to simulate 40 years of plant life at aged at 100 °C (212 °F) passed the LOCA test.

The Okonite Company had certified these cables to be qualified for 40 years of plant life at 90 °C (194 °F). However in the past, during licensee E0 inspections, the NRC has taken exception to the Okonite certification but has allowed the use of Okonite cables for applications of up to approximately allowed the use of Okonite cables for applications of up to approximately of °C (131 °F) for 40 years of plant life. Based on the recent Sandia tests, 71 °C (131 °F) for 40 years of plant life. Based on the recent Sandia tests, the staff is now concerned that a potential deficiency exists in the environmental qualification of these Okonite Hypalon bonded-jacket cables when they are used in environments with temperatures greater than 50 °C (122 °F) for forty years.

The staff met with representatives of the Okonite Company and Sandia on Monday, November 23, to discuss the validity of the Sandia test results and Okonite's position. NUMARC was also represented. At the meeting, Okonite Verified that they have not performed qualification tests of the same cable used by Sandia. They had previously tested a larger cable with the same insulation and jacket materials for qualification to 90 °C (194 °F) for 40 years.

The Commissioners

Okonite stated that they have test data that show no chemical interaction exists between Hypalon and EPR. Okonite agreed that the Hypalon jacket ages more quickly than EPR insulation. However, the Sandia results indicate a mechanical failure of the insulation resulting from the embritlement of the Hypalon. Okonite stated that Sandia had applied a full accident radiation dose before any thermal aging, which in their opinion was extremely severe, and also that Sandia overaged the cable during thermal aging.

In addition to the Okonite failures; cables with bonded jackets manufactured by Samuel Moore have also failed during Sandia LOCA testing. These cables were Dekoron Dekorad Type 1952, two-conductor, twisted, shielded pair, 16 AWG instrument cables covered with ethylene-propylene diene monomer (a type of PR) insulation with a bonded Hypalon jacket and an overall jacket of Hypalon. EPR) insulation with a bonded Hypalon jacket and thermally aged to a 20-year One cable in which one conductor failed had been thermally aged to a 20-year ife at 55 °C (131 °F), while the other cable in which both conductors failed ife at 55 °C (131 °F), while the other cable in which both conductors failed rad been thermally aged to a 40-year life at 56 °C (133 °F). These failures and been thermally aged to a 40-year life at 56 °C (133 °F).

Qualification data reviewed by the staff for Samuel Moore cables show that cables with bonded Hypalon jackets had been previously tested. The test reports documented qualification of the Dekoron Dekorad cable to a qualified life of 40 years at plant service conditions of 52 °C (126 °F) or less.

Based on the Sandia test results, the staff has concerns that qualification has not been established for cables with bonded Hypalon jackets when their installed service conditions exceed environmental conditions of 50 °C (122 °F) for 40 years and that installed electrical cable with bonded Hypalon jackets for 40 years and that installed electrical cable with bonded Hypalon jackets may be susceptible to failure. There is a potential for failure during a LOCA may be susceptible to failure. There is a potential for failure than 50 °C. tefore 40 years if these cables are used at temperatures greater than 50 °C.

The staff is also concerned that other bonded-jacket cables, qualified for up to 90 °C (194 °F) applications, as claimed by various vendors, may be susceptible to the same type of failures. The difference in aging rates between the jacket and the insulation may be a factor in the failure of between the jacket cables. Therefore, qualification testing that does not use the bonded-jacket cables. Therefore, qualificative of actual cable performance. jacketed configuration may not be representative of actual cable performance.

Data supplied by Okonite indicate that their product is used in approximately Data supplied by Okonite indicate that their product is used in approximately 62 plants. Based on data collected by EPRI, Okonite cables are used in the reactor containments of about 25 plants. The data does not specify whether these are all safety-related applications and whether the installed cables are the same as those tested by Sandia. The staff does not currently know how the same as those tested by Sandia. The staff does not currently know how on many plants use other bonded-jacket cable in safety-related applications in containment.

The Sandia test results indicate that some components that are relied upon during a LOCA may not remain functional for the full 40-year life of the power plants. While this would present a long term safety concern, there is no immediate safety concern because: (1) the test results are considered to be The Commissioners

of most concern with cables installed in containment; (2) the test results would apply to a relatively small number of safety-related cables in containment; (3) cables in containment have been in service for less than 40 years; (4) during plant operation BWR drywell temperatures are typically in the range of 57 °C to 66 °C and PWR containment temperatures (outside the the range of 57 °C to 66 °C and PWR containment temperatures (outside the reactor cavity) are in the range of 37 °C to 43 °C; (5) the probability of a large-break LOCA is approximately 10° per reactor year; and (6) there are large-break LOCA is approximately 10° per reactor year; and the process of

While there is no immediate safety concern, the staff is in the process of issuing an information notice to alert licensees to this potential deficiency. Licensees would be expected to review the information notice and consider appropriate actions if they find bonded-jacket cables used in safety-related applications at temperatures greater than 50 °C (122 °F). Generic Letter applications at temperatures greater than 50 °C (122 °F). Generic Letter S8-07 "Modified Enforcement Policy Relating to 10 CFR 50.49, "Environmental S8-07 "Modified Enforcement Policy Relating to 10 CFR 50.49, The Nuclear Power Dualification of Electrical Equipment Important to Safety for Nuclear Power Dualification of Electrical Equipment Important to Safety for Nuclear Power Plants" describes actions to be taken by licensees when a potential efficiency in environmental qualification is identified.

The staff has discussed this concern with NUMARC and will be preparing a written request to seek their assistance in the resolution of this issue. Among the near term (six months) actions expected of NUMARC would be the gathering of information to identify where bonded-jacket cables are used in nuclear plants and the environmental conditions in which they are installed. Other actions could include cable inspections to determine the material condition of the installed cables.

If the results of the near term actions confirm the validity of the concerns. NUMARC would be requested to take the lead in developing a long term industry program to resolve the issue. Based on monitoring and evaluation of NUMARC/industry actions. the staff will assess the need for additional generic communications or staff actions.

While this memo describes planned actions, it should be recognized that this is an evolving issue and the described actions may be changed as more information is obtained on bonded-jacket cables and their safety-related applications in nuclear plants. Original signed by James M. Taylor



Enclosure 3

TASK ACTION PLAN OUTLINE FOR BONDED-JACKET CABLES

TASKS COMPLETED

- 1. Met with Okonite, Sandia, and NUMARC at Headquarters.
- Issued memorandum to Commission discussing potential deficiency.
- Issued Information Notice to notify licensees of the potential deficiency in environmental qualification of bonded-jacket cables.
- Send letter to NUMARC to see if they were interested in assisting industry in resolution of issue.

TASKS TO BE TAKEN and APPROXIMATE SCHEDULES

- Review available bonded-jacket cable test data (Sandia and Qualification) Scheduled Completion: Ongoing
- Arrange meeting with NUMARC to discuss their involvement in resolution of issue. Scheduled Completion: January 29, 1993
- Arrange meeting with NUMARC at Sandia to review the test data and view the test facilities. Scheduled Completion: February 24, 1993
- Issue a TI for Regional inspection of cable environments and conditions. Scheduled Completion: July 15, 1993 *
- Issue a Generic Letter (GL) requesting licensees provide information regarding the use of bonded-jacket cables, their qualification, and service conditions. Request response within 60-90 days. Scheduled Completion: October 15, 1993 *
- Review and evaluate information gathered by various methods discussed above. Determine long term safety significance and determine actions needed for resolution of issue. Scheduled Completion: 6 months after receipt of information from industry action or GL
- NOTE: * Items 4 and 5 will be initiated; however, they may not be completed if NUMARC and industry actions are sufficient to allow determination and implementation of required actions (if needed) for resolution of issue.

December 29, 1992



UNITED STATES NUCLEAR REGULATORY COMMISSION WASHINGTON D. C. 20555

December 22, 1992

Mr. William Rasin Vice President and Director Technical Division Nuclear Management and Resources Council 1776 Eye Street, NW Suite 300 Wasnington, DC 20006-2496

Dear Mr. Rasin:

The purpose of this letter is to notify you of a potential deficiency in the environmental qualification of electrical cables with bonded jackets. The concerns of the U.S. Nuclear Regulatory Commission (NRC) regarding the cualification of bonded-jacket electrical cables are discussed in NRC information Notice (IN) 92-81. Failure of Electrical Cables with Bonded Hypaion Jackets." which is enclosed.

is stated in the IN. the potential deficiency was identified as the result of testing conducted for the NRC by Sandia National Laboratories. On the basis of test results for the electrical cables with Hypalon bonded jackets and the ensuing evaluations of available data, the NRC has concluded that Hypalon and other bonded-jacket cables in safety-related applications may be susceptible to failure when installed service conditions exceed temperatures of 50 °C (122° F) for 40 years.

while the NRC believes there is no immediate safety concern, the staff is evaluating the extent of this potential deficiency and developing actions recessary to resolve this issue. The staff is considering a Generic Letter as a means to gather information required to ascertain the long-term safety rignificance of this issue. The information needed includes: the quantity of conced-jacket cables being used in safety-related applications: the environmental qualification status of these cables; the actual service conditions of the cables: and the material condition of the installed cables.

The NRC is notifying you of this potential deficiency and the initial NRC actions to determine if NUMARC is interested in being the focal point for industry in resolving this issue. Initially, NUMARC may be able to assist industry by: (1) coordinating the collection of information that identifies where bonded-jacket cables are used in nuclear plants and their installed environmental conditions and (2) developing and coordinating a licensee inspection effort to determine the material condition of installed bondedjacket cables.

is you are probably aware, much of the Sandia test data that are the basis for the IN and the NRC concerns have not yet been published. Therefore, if NUMARC secides to assist industry in the resolution of this issue, we will notice a sublic meeting at Sandia with NUMARC as the industry focal point. The meeting would be held at Sandia so that the test facilities can be observed, test

December 22, 1992

Mr. .illiam Rasin

samples and test data can be inspected, and direct discussions can be held with the people who conducted the testing. By providing this opportunity to review the test data first hand, NUMARC and industry will be able to obtain an understanding of the Sandia test activities and the significance of the test results in order to better develop and coordinate an industry program to address the NRC's concerns with bonded-jacket cables.

If NUMARC is interested in assisting industry in the resolution of this issue, we would be happy to meet with you or members of your staff at your earliest convenience to discuss how NUMARC can best help industry and to provide more details on the staff's concerns relative to this matter.

If you have any questions regarding this letter or need further information on this issue, contact Conrad McCracken at (301) 504-2873 or George Hubbard at 301) 504-2870.

Sincerely,

tophonel

William T. Russell, Associate Director for Inspection and Technical Assessment Office of Nuclear Reactor Regulation

Enclosure: is stated