CABLE AGING MANAGEMENT

Computer Based Training Module Available on NANTeL

ABSTRACT

This CBT is a self-paced, detailed, comprehensive, nuclear industry generic overview of the electrical cable degradation for inaccessible and difficult to access cables. The training will provide generic design and licensing basis for understanding cable material and construction and how these degrade over time and with exposure to the elements. The engineer will learn identification of key attributes, walk down and evaluation criteria and proper testing criteria.

INTENDED AUDIENCE

1. Experienced nuclear plant electrical engineers who are developing expertise in Cable Aging Management
2. Site engineering Managers or Supervisors

DURATION

- 4.5 hours
- An additional 8-12 hours for reading materials provided within the CBT

TERMINAL LEARNING OBJECTIVES

1. Describe key aspects of cable construction.
2. Describe the characteristics of cable insulation and jacket materials.
3. Describe designs of cable routing infrastructure.
4. Identify stressors that cause insulation and jacket degradation.
5. Identify installation and operating practices that may adversely affect cable life.
6. Identify cable insulation and jacket degradation mechanisms.
7. Determine the consequences of cable failures.
8. Describe regulatory guidance that pertains to cable performance.
9. Prioritize cables according to degradation likelihood and importance.
10. Describe methods for cable walkdowns and the key attributes to be identified.
11. Evaluate the results of cable walkdowns and findings of key attributes.
12. Understand the basis for selection of cables for testing.
13. Define appropriate cable testing techniques.
14. Identify success criteria for evaluating cable test results.
15. Identify key attributes for cable harvesting plans and supporting procedures.
16. Describe measures that should be undertaken following a cable failure to prevent recurrence and improve cable aging management.
17. Identify key attributes for degradation mitigation plans.
18. Identify key attributes for long-term plans for cable maintenance and replacement.
19. Evaluate cable condition, performance, and risks in context of continued operation.

KEY INDUSTRY DOCUMENTS

1. EPRI 1007933 Aging Assessment Field Guide
2. EPRI 1013187 Plant Support Engineering LCMP Sourcebooks-MV Cables and Acc
3. EPRI 1019937 (partial) EPRI Underground Distribution Systems Reference Book
4. EPRI 1020804 AMP for LV Cable
5. EPRI 1021629 AMP for I+C Cables
6. EPRI 1022968 Cable Aging Management Program Implementation Guide
7. EPRI 3002000557 AMP for MV Cables
8. EPRI 3002002994 Plant Engineering Field Guide for Harvesting Service Aged Cable
9. EPRI 3002005322 MV Cable Polymer Handbook
10. EPRI TR-109619-Guideline for the Management of Adverse Localized Equipment
11. IEEE 400.2-2013 VLF testing
12. IEEE 400.3-2006 PD testing
13. IEEE 400-2012 Field testing
14. IEEE 1185-2010-IEEE Recommended Practice for Cable Installation in Generating Stations and Industrial Facilities
15. IEEE 1242-1999 IEEE Guide for Specifying and Selecting Power, Control, and Special-Purpose Cable for Petroleum and Chemical Plants
16. IEEE 1511-2004 Guide to Evaluating Failures
17. IEEE 1617-2007 IEEE Guide for Detection Mitigation and Control of Concentric Neutral Corrosion in Medium-Voltage Underground Cables
18. INPO EPG-16 Engineering Program Guide Electric Cable Reliability
19. INPO SEN 272 Underground Cable Ground Fault Causes Forced Shutdown
20. NEI 06-05 Medium Voltage Underground Cable White Paper
21. NRC CR 77-06 Effects of Hydraulic Fluid on Electrical Cables
22. NRC GL 2007-01 Inaccessible or Underground Power Cable Failures
23. NRC Inspection Manual IP 71111-06 Flood Protection Measures
24. NRC NUREG 1801, R2 - GALL Report XI
25. NRC RG 1-218 Condition Monitoring Program for Electric Cables Used in Nuclear Power Plants