US INDUSTRY PRACTICES FOR MV CABLE FLEET MANAGEMENT

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ABSTRACT

Utilities are faced with the ever-increasing challenge of providing high reliability from an aging infrastructure of underground distribution cables. Management of this critical asset in the utility system begins with the specification and purchasing of high-quality products and continues with installation, maintenance, operation, diagnostics, and repair or replacement at end of life. This report describes the results of a survey conducted across the industry. Participant companies ranged from small rural cooperatives to investor-owned utilities in large metropolitan areas with dense network systems. Results of this research project will be leveraged to develop recommendations for utility cable fleet management programs to help prioritize cable replacement and support proactive asset management.

KEYWORDS

Distribution cables; medium voltage cables; primary distribution; life-cycle management; cable fleet management; diagnostics

INTRODUCTION

The underground medium-voltage (5-35 kV) distribution cable system can be one of the more challenging components of the utility system to maintain and operate at very high levels of reliability. Utilities in large metropolitan areas can easily have tens of thousands of kilometers of underground cable spread over hundreds of square kilometers of service territory. Additional complications includes a changing mixture of cable types, often poor records on location and service history, and many assets over 40 years of age.

Diagnostic testing of aging cable systems has the potential to identify problems prior to failure and allow repairs or replacements without service interruption to customers. However, questions remain as to the effectiveness of different test methods applied to one cable type versus another. The equipment or outside service providers can be expensive. These factors make economic justification of system wide implementation of such programs difficult. In addition, system wide replacement of cables based solely on age is not economically viable. This raises the question of how to identify those assets in need of repair. Should cable systems be operated in a "run-to-failure" mode as has traditionally been the case?

Strong asset management plans for the underground cable fleet must start with specifying and purchasing high-quality cable products. Incoming inspections can ensure that standards are met. The cables and accessories must be properly installed and, if possible, tested prior to service to avoid early failures resulting from defects or poor workmanship. Following this, an understanding of local and industry wide failure rates and failure mechanisms for various cable types, combined with effective diagnostics, will enable prioritization of repair and/or replacement programs within available budgets.

The Electric Power Research Institute (EPRI) is conducting research to develop guidelines and identify outstanding industry practices for the overall management of this system asset. The first step in this process is an industry survey to better understand current practices in the overall life cycle management of underground distribution cable systems [1]. EPRI is looking for outstanding and notable programs and processes that may be shared or highlighted. This paper presents the most notable results of the survey. Detailed review of each question and answer is not possible in the space provided.

SURVEY STRUCTURE

The survey was conducted in the summer of 2010 and included a cross section of the US distribution system operators. More than 40 surveys were sent out with respondents from very large investor owned utilities in large metropolitan areas to small rural cooperatives. The full range of underground medium voltage cables including network systems and residential distribution was included.

Forty two questions were structured to obtain information related to total cable system management. The questions were divided into six parts: 1) general, 2) procurement, 3) installation and maintenance, 4) diagnostics, 5) planning, analysis, and costing, 6) case studies.

The survey was conducted using the online tool Survey Monkey with personal communications to participants for clarifications and follow up questions.

SURVEY FINDINGS

General

This section of the survey gathered background information on the utility, the size and breadth of their medium voltage cable system, and basic issues facing the cable engineer.

There was strong interest from utility engineers to better understand cable replacement strategies used by peer organizations, and what criterion is used to evaluate cable segments and how replacement budgets are prioritized.

Also of high interest are knowledge and understanding of what type and design of cables peer organizations are using for different applications (network vs. residential distribution) and criteria for selecting cables, joints and specific vendors.

A key issue for cable engineers participating in the survey is the use of diagnostic testing. Cable engineers in the US are looking for testing technologies and hardware that is simple to use and provides highly accurate results. Elimination of false positive and false negative results must be achieved. Techniques and hardware must be usable by technicians in the field with simple data interpretation that is actionable on site. Utilities do not wish to rely on third-party vendors for testing. Diagnostics