LARGE PROJECTS OF EHV UNDERGROUND CABLE SYSTEMS

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ABSTRACT

European manufacturers had greatly contributed to the preparation of IEC 62067. Several big projects of underground cable systems up to 500 kV have now been carried out by European manufacturers throughout the world. CIGRE recommendations and later on IEC 62067, have been in all cases the customer technical requirement. This paper summarizes this experience developed by European Companies. The purpose of this paper is two-fold:

- to describe the big projects installed by European manufacturers from 345 kV to 500 kV taken into account by CIGRE B1.06 in its work, providing data on the electrical stresses adopted for the cable, on the accessories and the installation conditions,
- to analyse to which extent the recommendations of CIGRE B1.06 address the issues outlined in Paper A.2.5 of Jicable 2003.

KEYWORDS

EHV Cable systems, IEC 62067, Revision of qualification procedures, CIGRE Technical Brochure 303, Jicable 2003 Paper A.2.5

INTRODUCTION

In Jicable 2003, paper A.2.5 [1] recalled the first experience gained by European Cable Manufacturers and described the main first big European cable projects.
As recalled, each time, tests specifications included in IEC 62067 published in 2001[2] (or CIGRE recommendations of Electra 151[3]) had proved to be the expected sole of the technical specifications attached to each individual project. Each time, to better fit to the specific features of the project, additional tests were felt necessary to demonstrate the performance of the proposed cable system in the proposed installation configuration according to various CIGRE recommendations.
Since June 2003, all big projects mentioned in Paper A.2.5 have been successfully completed and other big projects have been carried out by European cable manufacturers in and out of Europe.
Despite its broad range of application, the IEC standard does not cover all requirements. Furthermore, in order to be able to provide to users the last available technologies, it appeared very soon important to establish a testing regime which, once the capability of a cable system supplier to produce EHV cable system is proven, allows the qualification of innovative solutions with stringent requirements but implying shorter test durations at acceptable costs.
All these issues were listed in Paper A .2.5
At this time, CIGRE Working Group B1.06 had just been launched by Study Committee B1 with the goal to prepare recommendations for evolutions of IEC 62067 taking into account the expected innovations in cable technology, the need to reduce the time to market and the overall cost to introduce new evolutions as well as service experience collected by the Cable Industry.
The work of CIGRE WG B1.06 has been completed in August 2006 and has been published in CIGRE Technical Brochure 303[4]. Chapter Two of Technical Brochure 303 gives the recommendations for EHV cable systems. These recommendations have been based on the experience gained on installed EHV cable systems inventoried in Chapter One. An important part of this service experience is coming from European cable projects. These projects will be described in detail in 2.2.

EXPERIENCE OF EHV CABLE SYSTEMS CONSIDERED BY WG B1.06 IN TB 303

Summary of TB 303

Four main chapters compose TB 303.

Chapter One, as an Introduction, recalls and details the Scope of Work and the Terms of Reference of WG B1.06 and gives an overview of the service experience of HV and EHV cable systems till August 2006 as well as a survey of experience obtained by testing EHV cable systems.
Much of the service experience with HV XLPE cable systems is based on cables with moderate design stresses. XLPE has only recently become the insulation of choice for many utilities for EHV transmission circuits. The introduction of XLPE for longer transmission circuits has generally followed the completion of a one year heat cycle voltage test called prequalification (PQ) test, which was recommended by CIGRE in 1993 in Electra 151 and afterwards specified in IEC 62067, Ed1 in 2001.

Chapter Two covers long duration tests on EHV cable systems and the different features which are examined:

- Design concept
- Electrical performance of cable and accessories
- Performance of a cable system under prolonged heat cycling
- Aspects of installation design and practice