



#### A.4.4.

### Development and prequalification of large conductor VHV cable systems

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#### Abstract:

Due to market deregulation and improved management of available power generation plants, this last decade has seen the need to increased power transmission. This has led to the design of large conductor ( $\geq 2000\text{mm}^2$ ) VHV solid insulated cables systems.

The authors describe the development works on conductors (optimised use of copper), on cable design, on connectors for joints and termination (mechanical and electric tests) on accessories that have led to the definition of the large conductor insulated cable systems properties.

On the other hand, the cable makers knowledge base has been used to optimise the system handling and installation while keeping its environmental impact to a minimum level.

Results concerning  $2000\text{mm}^2$  aluminium, 2000 and  $2500\text{mm}^2$  copper cable system are presented. Extension to  $3000\text{mm}^2$  copper and  $2500\text{mm}^2$  aluminium is discussed.

**Keywords:** large conductor, VHV system

#### 1. Introduction

Due to the improved management of available power generation plants, this last decade has seen the need to increase power transmission. On the other hand, environmental concerns make more and more difficult the erection of new overhead lines. They are locally replaced by buried links. This has led to the design of large conductor ( $\geq 2000\text{mm}^2$ ) VHV solid insulated cable systems.

The authors describe the development works :

- on conductors (optimised use of copper),
- on cable design,
- on connectors for joints and termination,

that have led to the definition of large conductor insulated cable systems properties.

#### Résumé:

En raison de la dérégulation du marché de l'électricité, et de l'optimisation de la gestion des centrales électriques. Le besoin d'accroître les performances du réseau de transport d'énergie est apparu. Ceci a impliqué localement la mise en place de systèmes de câbles synthétiques isolés et accessoires THT de forte section ( $>2000\text{mm}^2$ ). Des travaux de développement ont été réalisés à ce propos :

- conception du conducteur (plus particulièrement l'optimisation des conducteurs cuivre),
- conception du câble,
- connecteurs de jonction et extrémité.

En outre les constructeurs ont tiré parti de leur savoir-faire en termes de transport, manutention et installation pour limiter l'impact environnemental de la phase de construction de la liaison.

L'article présente des résultats concernant les systèmes de câbles de section  $2000\text{mm}^2$  aluminium, et 2000 et  $2500\text{mm}^2$  Cuivre. L'extension à  $2500\text{mm}^2$  aluminium et  $3000\text{mm}^2$  cuivre est envisagée.

**Mots clés:** forte section, système THT

#### 2. Conductors development

Large conductor cross section means large current :

- $> 3500\text{ A}$  in transient stage for a  $2000\text{ mm}^2$  copper conductor.
- $> 2000\text{ A}$  in transient stage for a  $2000\text{mm}^2$  aluminium.

Such a high current generates stresses :

- thermal (joule effect)
- mechanical (electrodynamic forces)

#### 2.1 Copper conductors

In the case of copper conductors, skin and proximity effect have to be managed. The use of insulated wires in Milliken design gives the best conductivity [1].