

**ICOLIM 2017 – Best Paths Special Session  
Conference Papers Abstracts****Development of a new type of conductor car from design to assembly**

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*Abstract* — Conductor cars are widely applied during different live-line activities on bundled phase conductors: they ensure a stable, but movable platform for the workers to execute even long and difficult tasks in a safe and ergonomic way. In the High Voltage Laboratory of Budapest University of Technology and Economics a new type of conductor car is being developed. Not only the design, but the material selection and the way of assembly is novel. The extra light design is proposed to be able to pass through insulators as well. The first step of the development was the material selection with thermal and mechanical aging and mechanical breaking tests followed by the evaluation of the different types of connections. Mechanical finite element simulations were executed to determine the mechanical safety factor of the prototype in case of different loading conditions. Electrical simulations were focused on the electric field distribution especially during critical arrangements with energized and grounded parts close to each other. After the determination of the safety factors, assembly of the prototype has begun followed by different laboratory tests. Evaluation of related standards was also the part of the work. This paper introduces the process of the design from the first step to the assembly and testing of the prototype. A demonstration on energized network is currently being organized to introduce the capabilities of this new equipment to increase the efficiency of live-line maintenance executed by bare-hand method.

**Accelerated electrical and mechanical ageing tests of high temperature low sag (HTLS) conductors**

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*Abstract* — As part of the Best Paths project, work package 6 of the DEMO #4 combines the R&D tasks for repowering of transmission overhead line corridors. The aim of the presented research work is the electrical and mechanical investigation of high temperature low sag conductors (HTLS) and their respective accessories. In contrast to the conventional ACSR (aluminum conductor steel reinforced) conductors, new material combinations of HTLS technologies result in a better sagging behavior combined with an operation at higher temperatures. Because of missing operational experience, the ageing behavior of HTLS conductor technologies shall be analyzed regarding the operating parameters such as electrical, thermal and mechanical load.

## Innovative insulated cross-arm: requirements, testing and construction

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*Abstract* — The first inquiry for new tower designs was launched by Elia (the Belgian TSO) in 2008 in the frame of the need for new 380 kV transmission lines. The requirements of this inquiry included minimum visual effects (similar to the existing 150 kV tower silhouette), low EMF and AN levels under the line and a maximum transport capacity of 3 GVA/circuit. Based on these requirements the innovative compact overhead line with insulated cross-arms made of composite insulators have been designed and installed. This work resulted in a comprehensive project including a number of phases:

- Development of proper specifications.
- Evaluation of different designs from maximum E-field point of view.
- Type testing according to the specification.
- Development of new test methods and verification of the complete design.
- Demo and construction.

This paper presents the overview of the phases above in relation to the insulated cross-arms. The final design of the tower became similar in height as the existing 150 kV line, however operating at 380 kV. Thus, it was relatively easy to get the public acceptance, and at the same time increase the transfer capacity of energy almost 10 times. This makes Elia's project an excellent example for many European power utilities.

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## A round robin test of the water induced corona test

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*Abstract* — There is an exponential growth in application of composite insulators during the last decade(s). They are especially popular for overhead line refurbishment and compact lines and these applications require higher demands on electric field grading. Two main criteria are used for the dimensioning of grading rings for composite insulators, the first one for the metal parts and the second for the housing of the insulator. If the second criterion is not fulfilled, deterioration of the surface could occur due to water induced corona.

STRI has developed a test method to verify the second criterion on full scale products. This test method was repeatable and has been used by STRI with success in several practical applications. The goal of this paper was to verify further application of the test method internationally. Thus, for the evaluation of the reproducibility a Round Robin Test in five different laboratories was performed with very positive results.

## Comparison of previous and most recent Cigré recommendation for thermal rating calculations of overhead lines

E. Petersson / STRI

*Abstract* — A new Cigré guide for thermal rating calculations of overhead lines, Cigré TB 601 [1], was issued in December 2014. It was an update of the previous Cigré TB 207 [2], covering the same subject. The new Cigré guide has been improved for several issues; mainly a more accurate model for steel core conductors operating at high current densities, an improved solar heating model and an improved convection model at low wind speeds.

A program for thermal rating calculations, called I-Line, has been developed by STRI and used by the Swedish transmission line operator Svenska kraftnät. I-Line was based on the previous Cigré TB 207. The program has been recently updated according to the new Cigré TB 601. This gives the opportunity to compare the results of the two thermal rating methods. Transmission line operators would typically want to know the difference before starting to use new calculation routines.