# Overview of CIGRÉ WG B1.56 regarding the verification of cable current ratings

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## *ABSTRACT*

*To ensure that calculation tools compute the current rating of a power cable in a trustworthy manner, a set of 11 case studies is provided where MV, HV, AC and DC cable systems are considered in land and submarine applications. 40+ guidance points were developed which provide clarifications, additions, or changes to the existing IEC standards for current ratings to ensure that individual cable specialists using different tools, techniques or computer software can find the same, consistent current rating in similar cases. In this paper, key learning points are shared and a new CIGRÉ Technical Brochure (TB) is announced.*

## *KEYWORDS*

Power Cables, Current Rating, Ampacity, Medium Voltage, HVAC, HVDC, Thermal Calculations, Design, CIGRÉ, IEC

## INTRODUCTION

The International Electrotechnical Commission (IEC) publishes standards, which use formulae to calculate the current rating of a cable system. The current rating (often named “ampacity”) is the current which a cable can carry over a given time, such that the conductor attains – but does not exceed – the maximum operating temperature.

Generations of engineers have developed their own spreadsheets and tools or use commercial software applications for computing cable ampacities. At present, there are no means to verify the accuracy of the results obtained with various computational tools. To address the need for such verification, the CIGRÉ Cable Study Committee B1 decided to launch a dedicated working group (WG) with the task of providing guidance and test cases that apply industry-accepted methodologies to allow verification of the calculation techniques and the results of any tool that implements them.

The current rating depends on the assumptions made by an engineer that performs the calculations. This has a direct impact on the design of a new system or on the cable loading limitations of an existing cable installation. In contrast with the voltage withstand capabilities of a power cable, the current rating is not physically tested. The only evidence that a certain current rating is achieved is provided by the calculation itself, or in extreme cases, where the cable fails from thermal overload. The verification of the calculation is, therefore, essential. Recommended methodologies were already advised in CIGRÉ TB 640 [1], and the means to perform the verification of the current rating calculations will soon be published in a technical brochure prepared by CIGRÉ WG B1.56.

In this paper, the background and verification methodology developed by the Working Group will be introduced. Also, key points of guidance will be shared to overcome pitfalls, interpretation issues and missing elements when calculating the current ratings of power cables. Furthermore, the various case studies will be introduced in this paper. Future work activities of this working group will be discussed as well.

The full guidance will become available in the CIGRÉ Technical Brochure. In that TB, guidance will be given on the interpretations, definitions and assumptions, but also on the calculation steps for a number of power cable designs with sufficient detail to assist in verifying other calculations.

## BACKGROUND

This paper introduces a TB that is intended to be used by cable specialists who perform current rating calculations themselves or request calculations from others.

The current rating depends not only upon the electrical and thermal parameters of the cable itself, but also upon the thermal parameters of the environment in which it is laid. It is well known that the different thermal resistivities of soil (chiefly depending on the density and moisture content) may strongly vary along the route and unless extensive measurements are taken, these parameters