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Experience with 2nd generation gas-insulated transmission lines GIL

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Abstract: The Gas-Insulated Transmission Lines (GIL) of the second generation are now in services since more than 2 years, with very good service experiences. The 2nd generation GIL is insulated with N₂/SF₆ gas mixtures and the design and laying technique is primary dedicated to long distance transmission lines.

The paper gives examples of the key experiences for long distances applications and shows future possibilities where GIL is the best technical solution. New applications of GIL as a high power transmission line used together with public accessible tunnels like train or street tunnels will be explained. Also the application of special energy tunnels over long distances will be explained.

Keywords: Gas-Insulated Transmission Line (GIL) - Tunnel Laid - PALEXPO - Sai Noi - Design and Layout of GIL - High Power Transmission - Long Length

1. Introduction

With the commissioning of the 500 m long gas-insulated transmission line (GIL) at the Geneva Airport, Siemens is the first manufacturer of the second generation GIL world-wide. This project concluded successfully the recent development works on this future transmission technology. The redesign of GIL brought a reduction of costs by more than 50 %. The main changes were replacing pure SF₆ by a gas mixture of N₂ and SF₆ as insulating medium and by adopting pipeline laying methods into the laying process.

Résumé: Les Lignes de transport à Isolation Gazeuse (LIG) de seconde génération sont maintenant en service depuis plus de deux ans et l'expérience recueillie en exploitation est très bonne. L'isolation de cette seconde génération de LIG est réalisée au moyen de mélanges gazeux N₂/SF₆. La conception et les techniques de pose sont essentiellement consacrées aux lignes de transport sur de grandes distances.

Ce rapport donne des exemples d'expériences clés concernant des applications longue distance et dégage les possibilités futures où la LIG constitue la meilleure solution technique. Il fournit des explications au sujet de nouvelles applications de la LIG en tant que ligne destinée au transport de grandes quantités d'énergie, installée dans des tunnels accessibles au public tels que des tunnels ferroviaires ou routiers. Il explicite également l'emploi de galeries dédiées pour le transport d'énergie électrique sur de grandes distances.

Mots clés: Ligne de transport à isolation gazeuse (LIG) – Pose en tunnel – PALEXPO – Sai Noi – Conception et implantation de LIG – Transport de grandes quantités d'énergie électrique – Grandes distances

Based on the now more than 30 years of experience in gas-insulated high voltage technology the redesign of the first generation GIL installed in 1974 at the Hydro Power Plant Wehr in Germany was started in 1995 with a first feasibility study together with EDF [1].

In the following for both types (directly buried and tunnel-laid) a prototype set-up was built at IPH, an independent test lab in Berlin. The development and test program have been carried out in co-operation with three major German utilities. The main intentions of the tests were to simulate the electrical and mechanical stresses of a lifetime of more than 50 years