

**A4.7****400 kV insulated cable link installation carried out at the Chaira pumped storage power plant in Bulgaria**

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Résumé

Pour installer la deuxième tranche de la centrale électrique de Chaira en Bulgarie, il a été réalisé une liaison de 400 kV par câble XLPE pour relier la sortie de 3 transformateurs 19/400 kV à la ligne aérienne. L'ensemble de la centrale électrique est situé à l'intérieur de la montagne. La liaison a été installée dans une galerie de 600 mètres de long dont environ la moitié présente une pente de 45°. Les conditions difficiles de cette installation ont amené des solutions particulières autant pour le choix de la technologie du câble, que pour les accessoires, les moyens de pose et les systèmes de fixation du câble. La collaboration entre les équipes du producteur d'électricité et du câblier a permis un franc succès dans cette affaire.

Summary

For the installation of the second portion of the Chaira Pumped Storage Power plant in Bulgaria, a 400KV XLPE cable link has been manufactured to join up the output of three 19/400 kV transformers to the overhead lines. The entire power station being situated inside a mountain, the link had to be installed along a 600 meters long gallery, half of which is over a 45° inclined slope. The difficult conditions involved in this installation led to some brain teasing solutions, not just in the choice of cable technology but also in regards to the accessories, laying methods and the cable fixation systems. Efficient partnership between both the power utility and the cable company teams can claim with just satisfaction a successful conclusion.

General Context

The Chaira Pumped Storage Power Plant is found in the south of Bulgaria, approximately 100 km from Sofia. This power station is a part of the most important hydroelectric site in the country. Of reversible type, it is made up of four turbine groups / pump, of a unit capacity of 200MW in turbine mode and 186.2MW in pump mode. The entire power station is built inside a mountain. The manufacture and installation of hydroelectric equipment was carried out in two stages. The works for the first stage were completed in 1995 and two groups are now operational. These are connected to three 19/400 kV single phase transformers which are installed in a cavern. In order to link the transformers, which are found approximately 300 meters under the mountain, a 400 kV oil filled link had been installed in a 600 meters long gallery. To carry out the second stage of the power station, the management of Nationalna Elekticheska Kompania ( NEK ) chose to install a this new synthetic insulation XLPE 400kV-output link.



View of lower barrage

Link description

A total link length of 600 meters, over an elevation of 190 meters, joined the three 19/400kV single phase transformers to the outside sub station, from where the overhead lines departed. Its route is parallel to the original oil filled cable link, although totally separated. The drawing shown hereafter describes the link.