Renewables Grid Initiative

Technical aspects of underground cabling

Technology:

The current state-of-the-art technology for underground cabling are extra high voltage cross linked polyethylene cables, or short EHV XLPE cables. At their core these cables consists of a copper conductor, which is surrounded by a thick XLPE insulation. Different shielding systems, such as aluminium laminated foil, can be added to protect the cable against water or to minimise magnetic fields. Power lines generally consist of several pieces of cable, which are combined with joints.

Installation:

Usually, the cables are laid directly into the ground, coated only by a sand blending or sometimes a mixture of sand and weak cement. Cable tunnels, ducts or pipes are also possible, but are a more expensive solution. The decision for an option like that is therefore most likely when a direct dig into the ground or the construction of overhead lines are impossible. Cable joints are the most sensitive points in the system. They can also be placed directly in the ground or be sheltered by an underground structure.

Challenges:

Transport: Technically it would be possible to manufacture very long pieces of cable that would need fewer or even no joints. But cables longer than 1,150 meters are so big and heavy that transporting them would be unmanageable, particularly on land with bridges and tunnels on the way.

Maintenance: EHV XLPE cables are tailor-made to the specifications of each project they are used for. Their repetition factor is therefore really small. For the TSOs that means having to keep replacement parts for all of their projects in stock. Additionally, TSOs that currently operate EHV cables report that outage times in case of failure are longer than expected. This is often linked to the unavailability of construction expert teams for the specific cable type.

Cable Installation *© ENTSO-E/Europacable*

More information:

Joint paper of Entso-E and Europacable: "Feasibility and technical aspects of partial undergrounding of extra high voltage power transmission lines"

RGI Cable Workshop: "Understanding Underground Cables", February 2013 in Switzerland

RGI Learning Group: on "Underground Cables" dealing with questions regarding the choice between overhead lines and cables

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