

MV self- supported insulated cables, a reliable and eco-friendly solution for protected and forest areas

Xabier **BALZA**, Francesc **SOLDEVILA**; Prysmian Group (PG), (Spain), Xabier.balza@prysmiangroup.com, francesc.soldevila@prysmiangroup.com

Josep **GONZALEZ**, Juan **GONZALEZ**, Rubén **IRANZO**; ENEL (EG), (Spain), josep.gonzalez@enel.com, juan.gonzalezl@enel.com, ruben.iranzo@enel.com

ABSTRACT

Specially protected areas such as natural reserves and parks usually have severe limitations to the trench digging, due to the associated land movements and the problems and hazards that these works mean for the local fauna and flora.

Even though MV aerial lines are a simple solution to this handicap, they have different problems linked to the long-term service, such as minimum distance to the tree branches in the vicinity, and temporary faults due to strong winds.

One of the biggest Spanish utilities has launched a development project based on insulated cables that tries to solve these problems while being economically sound.

KEYWORDS

Medium voltage, bundled cables, protected areas, eco-friendly designs.

INTRODUCTION

MV connections in rural areas are usually made by means of simple aerial lines that allow cheap and reliable enough power transmission.

While this is the best solution in most of the cases, there are some special areas where the aerial connections face different challenges, such as

- Growing fauna in the vicinity, with probable and frequent projection around the power lines.
- Temporary faults due to strong winds.
- Extreme low temperatures and high incidence of the ice sleeve phenomena.
- High salinity environments, where the conventional line insulators present frequent defects.
- Potential interferences with third party installations or activities due to the lack or incertitude of achieving the standard safety distances.
- Potential interferences with the local avifauna.

On the other hand, usually when these challenges are present the landscape does not help to install underground cables, because of the difficulty of digging the soil, the steepness of the mountain, or due to local laws protecting the ecosystem in case of protected areas.

The existence of bundled aerial insulated cables goes back more than 20 years, and even though the national specification from 2008 promotes this solution for the aforementioned circumstances, they have been used mainly for temporary connections linked to construction activities.

In this application the cables are hanged in very short connections by means of standard wood or metallic poles, and not much attention is given to long-term performance

to the connection, the accessories, the poles, or even the messenger.

The challenges that the development of the foreseen application to forest areas face cover the whole system and force therefore to make a system design approach.

The system approach in this project covers

- Insulated MV cables
- Messengers
- Joints and terminations
- Messenger's clamps
- Tower design and reutilization
- Sectorization and derivations
- Protection relays and network operations

MV BUNDLED CABLE

According to the Spanish regulation [1] the cable must be formed with three standard single core MV cables bundled around an insulated messenger with galvanized steel core. Among the standardized MV designs the chosen one was the RH5Z1; XLPE insulation, fire resistant polyolefin outersheath, and aluminium foil screen.

Being a standard design in Spain, there was no need for special test apart from the CPR qualification for these rather small sections (50mm², 95mm², and 150mm²). The E_{CA} according to EN 50575 qualification was completed successfully for both 12/20kV and 18/30kV families.

The insulated messenger required special mechanical type tests to verify the 6000daN minimum breakdown strength requested by the national regulation.

In this application both weight and dimensions are of the utmost importance, because of their influence in the tower calculations. This is not obvious for a plant dedicated to manufacture underground cables, but when these cables will be hanged, the declared maximum weight per meter and overall dimensions are critical to ensure the correct structural behaviour of the towers in front of any of the calculated service conditions.



Fig. 1: MV bundled cable

MV TOWER RE-DESIGN

Generally speaking the project approach is an upgrade of