

Experience with the operation of a temperature monitoring system on 90 kV underground links in Corsica

Minh NGUYEN TUAN, EDF R&D (France), minh-2.nguyen-tuan@edf.fr

Paul NOURRY, EDF CIST-INGEUM (France), paul.nourry@edf.fr

ABSTRACT

In this paper, the experience and knowledge gained through the operation of a DTS system on 90 kV underground links in Corsica are presented. The experience shows that deriving ready-to-analyze temperature profiles from raw data measured by the DTS system is not immediate. A thorough analysis of the temperature profiles is made to compare measures from different locations along the cable route, as well as measures taken at different times of the year.

KEYWORDS

Monitoring, temperature, DTS

INTRODUCTION

Several DTS (Distributed Temperature Sensing) systems are now commercially available for a wide range of applications. These solutions can benefit underground and submarine cable systems in various ways, including optimization of cable rating, hot spot localization and detection of changes in the cables environment.

In this paper, the experience and knowledge gained through the operation of a DTS system on 90 kV underground links in Corsica are presented. The DTS system is based on an OTDR (Optical Time Domain Reflectometry) technology and makes use of Brillouin scattering in optical fibers. Three circuits, with a total length of 18 km, have been monitored over a one-year period. Many different laying conditions are found on the cable route: PVC duct embedded in concrete, HDD (horizontal directional drilling), in trefoil or flat formation, with various spacings and laying depths. Optical fibers are laid in a separate duct, close to the power cables ducts.

MONITORED LINKS

Power cables

Three 90 kV underground links located in Corsica (France) were monitored. These links ensure the connection of three HV substations: Aspretto, Loreto and Vazzino (figure 1). Their characteristics are given in table 1.



Figure 1: Route of monitored links

Link	Cable	Length
Aspretto-Loreto	1200 mm ² Al	4720 m
Loreto-Vazzino	1600 mm ² Al	7150 m
Vazzino-Aspretto	1600 mm ² Al	5600 m

Table 1: Description of monitored links

Optical fibers

Optical fibers were originally laid along the cables for telecommunication purposes. Our experiment takes advantage of spare fibers for temperature monitoring.

The DTS system is installed in Aspretto. Optical fibers are connected in the three substations in such a way that six optical circuits are formed (figure 2):

- Circuits 1, 2 and 3: these circuits form a full turn (Aspretto-Loreto-Vazzino-Aspretto) and are used to assess the scattering between measures.
- Circuit 4: this circuit form two turns (Aspretto-Loreto-Vazzino-Aspretto- Loreto-Vazzino-Aspretto) and is used to assess the attenuation with distance.
- Circuit 5: this circuit ends in Vazzino (Aspretto-Loreto-Vazzino) where the fiber is partly buried and partly in open air, to measure ambient temperature.
- Circuit 6: this circuit is circuit 3 but measured in reverse direction, to check measurements consistency.