



380 kV Underground Power Line Monitoring Brugg, Switzerland

Project Overview

AP Sensing was selected by Brugg Kabel AG, a Swiss cable manufacturer, and SwissGrid, a Swiss transmission system operator, to monitor a new project at the Gäbihübel in Switzerland. SwissGrid is responsible for the operation, maintenance, renewal and expansion of the entire 6,700 km high voltage network in Switzerland.

This project represents an important component for the distribution and security of the power supply in central Switzerland and the region of Zurich, one of the largest metropolitan areas in the country. Throughout the duration of this project, a route of overhead lines will be replaced by underground power lines – a first for SwissGrid. Therefore, the operator needed a reliable and robust power cable monitoring system that provides an accurate temperature profile for all power cable phases. The monitoring system also indicates maximum temperatures and the locations of these temperatures along the entire circuit. For this challenging task, a 12-channel Distributed Temperature Sensing (DTS) solution from AP Sensing was selected.

Solution

AP Sensing's fiber optic-based DTS system utilizes passive fiber optic cables, which are non-intrusive and immune to electromagnetic interference (EMI). The power cables contain an integrated fiber optic sensor

running along the complete length of 1,500 m each. In addition to temperature monitoring, all 12 phases are monitored for fiber breaks which signal over integrated relays. The DTS continuously collects



Background

- First 380kV underground power line operated by SwissGrid
- Integral piece of the power supply in central Switzerland
- Challenge of maximizing circuit operations while meeting the high safety standards in Switzerland



Solution & Benefits

- One 12-channel Distributed Temperature Sensing (DTS) unit
- SmartVision for easy and intuitive monitoring of all critical landmarks
- Easy integration with existing operator system
- 24/7 continuous real-time monitoring data



temperature information for all phases of the buried 220 kV and 380 kV power cables. With this 24/7 real time monitoring data, the operator is able to maximize circuit utilization and prevent failure in emergency situations.

SmartVision

In addition to AP Sensing's DTS system, our intuitive graphical user interface (GUI), SmartVision, was selected by the customer. SmartVision is a centralized software that enables the monitoring of all critical sections at a glance. The software collects information provided by the DTS, further mapping it to the



power cable infrastructure so the operator can visualize and localize the analyzed data. With alarm zones configured individually, the client receives a solution that is customized to the special needs of their assets and infrastructure. Cable hotspots can easily be detected and localized within a few meters. Furthermore, the operator's team is able to create historical graphs of any point or section along the cable and can remotely supervise the entire power cable system.

Benefits

The circuit hotspot temperatures are provided via IEC 61850 to the customer's SCADA system. The SCADA connection to the already-existing system was successfully tested in 2020 and the DTS began operation immediately. After a thorough onsite training by our experienced project engineering team, SwissGrid is prepared to manage its own monitoring system.

Our DTS system is ideal for this project as it is resistant to EMI, which is typical for the application of power lines, and virtually maintenance-free. After commissioning of the underground power lines, the overhead lines will be disassembled.

SwissGrid plans to utilize insights from this project for various research purposes, such as the thermal behavior of the soil, subsequent biodiversity and the effects of magnetic fields. AP Sensing's DTS solution is an essential part of this endeavor.