

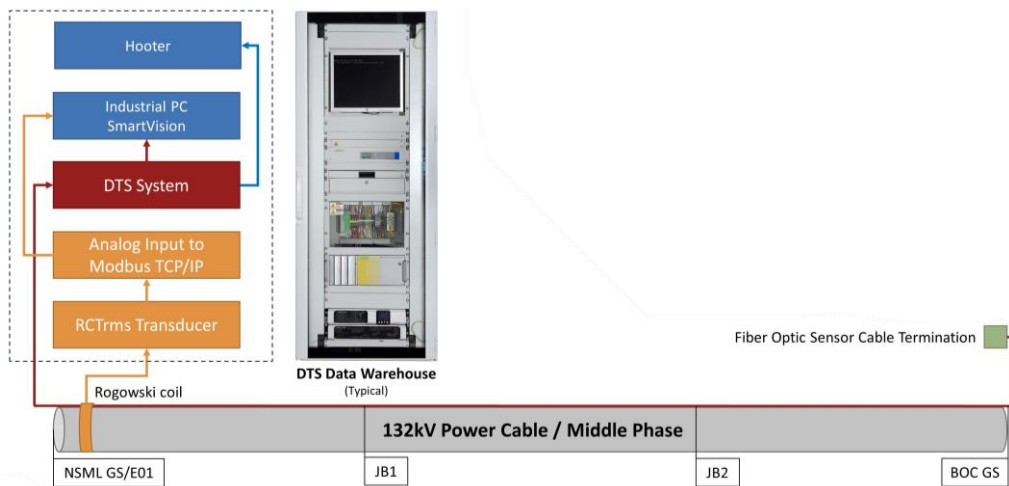


Underground Transmission Cable Temperature Monitoring

Karachi, Pakistan

Karachi Electric's 132 kV underground transmission cable, an industrial infrastructure, was expected to face greater loads than nominal lines. The cable feeds energy to a steel mill and as with high energy throughputs and frequent consumption cycles, end-to-end temperature monitoring of such cables is a key factor in reducing risks such as thermal overload and cable faults. Empowering operators with modern forecasting tools like Real Time Thermal Rating (RTTR) enhances operational insight and mitigates risks in advance. AP Sensing's power solution was chosen for its reliable cable temperature monitoring, built-in RTTR engine and asset viewer software with modern integration protocols.

K-Electric (KE) has powered Karachi, a beta-global city in Pakistan, for over 100 years through a network spanning across 6,500 km². KE is a vertically-integrated power utility company, managing generation, transmission and distribution of energy to all residential, commercial, industrial and agricultural areas that fall under the city's ambit and beyond, serving over 2.5 million customers.



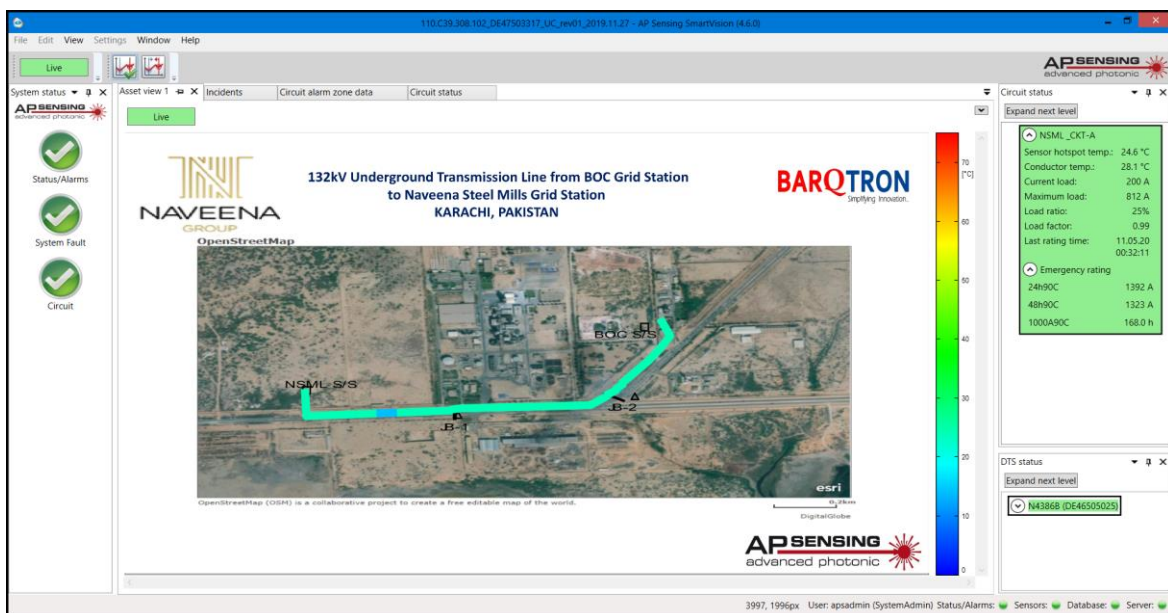
Utilizing fiber optic sensing cable attached end-to-end to the middle phase of the power cable, AP Sensing's Distributed Temperature Sensing (DTS) system interrogates the fiber optic cable and generates temperature profile data (traces) of the sensor cable. The traces are collected, processed and displayed by AP Sensing's visualization software SmartVision™. The fiber optic temperature data is mapped to the power cable, and SmartVision™ provides features such as asset visualization, RTTR, loading data collection from an external transducer, and the direct signaling of rating results and the alarm status to the customer's dispatch center.



HV Cable Termination

The Distributed Temperature Sensing (DTS) system monitors the HV power cable continuously, generating a constant data flow of temperature traces. 15 alarm zones are defined to generate pre-alarms at 65°C and alarms at 75°C anywhere along the 1.3 km of power cable. Special zones are also established for joint bays and facility crossings, such as roads and LNG pipelines. A Rogowski coil with a 4-20mA transducer is used for current load measurement, which is required for RTTR computation. An alarm hooter is connected with the DTS opto-coupled relays in order to trigger when alarm thresholds are reached.

SmartVision™ collects data from the DTS system and provides important information to operators in AssetViewer with key mapping and alarm information fed to the software. The RTTR engine boosts system capabilities by taking real-time temperature and load data into account. The RTTR engine, compliant with IEC 60287/60853, provides the calculated conductor temperature, cable ampacity and emergency ratings to address possible overload situations. Based on real-time project data, the RTTR engine calculated around 10% extra ampacity as compared to static calculations. Three emergency ratings were set up as per the client’s operational requirements at a target of 90°C conductor temperature. Based on the latest data histories, the RTTR engine predicted 71.5% and 62.9% safe overloading for 24 and 48 hour durations respectively.



SmartVision™ Asset Visualization Software