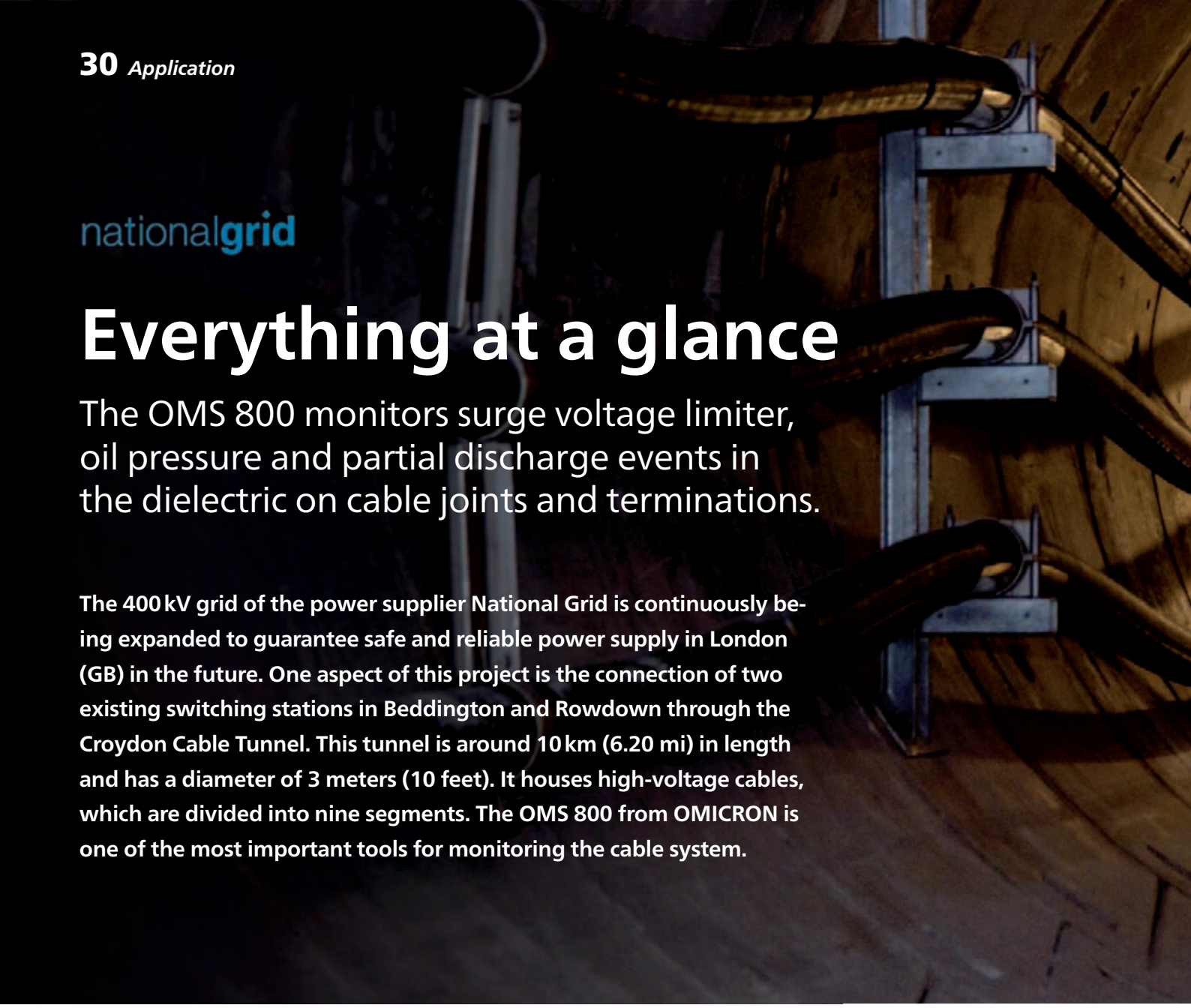

nationalgrid

Everything at a glance

The OMS 800 monitors surge voltage limiter, oil pressure and partial discharge events in the dielectric on cable joints and terminations.

The 400 kV grid of the power supplier National Grid is continuously being expanded to guarantee safe and reliable power supply in London (GB) in the future. One aspect of this project is the connection of two existing switching stations in Beddington and Rowdown through the Croydon Cable Tunnel. This tunnel is around 10 km (6.20 mi) in length and has a diameter of 3 meters (10 feet). It houses high-voltage cables, which are divided into nine segments. The OMS 800 from OMICRON is one of the most important tools for monitoring the cable system.

«OMICRON is a valuable partner that can provide us with optimum support— both now and in the future.»

Scott Sadler, Senior Project Manager at National Grid

The contracts for the construction of the tunnel were awarded back in 2004. In 2006, NKTcables from Denmark was brought in as the supplier of the high-voltage cable. Among other things, the contract included the installation of a monitoring system. As well as monitoring the surge voltage limiter (SVL) and oil pressure, the aim for this system was to also monitor the occurrence of partial discharge (PD) along the entire cable length, particularly at the joints and terminations. "NKTcables and OMICRON have been working closely together in the field of high-voltage cables for many years. This is one of the reasons why we were awarded the contract for the monitoring system," explains Thomas Ritz, Head of the Monitoring Solutions Division at OMICRON.

The Croydon Cable Tunnel which is 10 kilometers (6.20 miles) in length and has a diameter of 3 meters (10 feet) connects the stations in Rowdown and Beddington.

Installation inside the tunnel: The inductive sensor MCT 110 is sending the measured values to the OMS 840.

Unique combination

The project partners collaborated on the customer-specific design phase in 2009. In July 2010 the planning phase for the technical construction was successfully completed using the special requirements of National Grid as a framework. The combination of the three parameters and accompanying system components—SVL, oil pressure and PD—is what makes this particular monitoring system unique. PD data is recorded in real time at the eight cable joints and the cable terminations at the switching stations in Beddington and Rowdown. For each of the three phases inductive PD sensors are being used. The OMS 840 data capture unit, equipped with a protocol converter, gathers this data and forwards it to four OMS 800 data concentrators. These data concentrators are then connected to the central server for data management, data analysis, alerts and visualization. The OMS 840 also transmits the measured oil pressure in the cable terminations of all three phases to the monitoring server. The OMS 840 uses a test signal to perform a statistical Fast Fourier Transform (FFT) and determine the impulse response of the SVL allowing conclusions to be drawn about its operating state.

Improvisational talent required

"We performed the final visual inspection in February 2011 and then started the detailed planning work for the installation. The strict rules regarding tunnel access and the limited amount of time we were allowed to spend inside the tunnel required great flexibility on our part," explains Thomas Ritz. "For example, we had to devise a completely new process for packaging and delivering the components required on site, as some of the installation locations were several kilometers away from the tunnel access point." The new packaging con-

cept involved creating a carrying case containing installation material and all necessary tools for each deployment location. Between May and August 2011 the installation of the high-voltage cable was nearing completion, so the monitoring system was prepared for installation. "We were then able to complete all installation work in July 2011. The final inspections took place on July 21, 2011. Following a full system test and corresponding training, we handed over the monitoring system to National Grid on August 1, 2011," recounts Thomas Ritz.

After laying tests for high-voltage cables

Often acceptance tests are being performed by specialist companies commissioned by the cable manufacturer. These tests are time-intensive and expensive, as they require both a provisional fiber-optic network and the testing channels for these single-phase high-voltage tests to be set up.

OMICRON had already set up a fiber-optic network of this kind for communication purposes within the scope of operating the monitoring system, the acceptance tests were performed directly using the OMICRON infrastructure. The testing of all three phases was completed in just one and a half days, as OMICRON's partial discharge experts were on site to calibrate the monitoring system and were therefore able to combine these activities for the benefit of NKTcables and National Grid.

OMICRON as a valuable partner

National Grid is completely satisfied with the work performed by OMICRON. "Our cable supplier, NKTcables, selected OMICRON to develop and install a monitoring system for the full range of parameters and characteristics. In addition to this, the company also performed the necessary acceptance tests," explains Scott Sadler, Senior Project Manager at National Grid. "The real-time monitoring of high-voltage systems, providing status-based operational data to the monitoring center, is also a top priority for the future at National Grid. OMICRON is a valuable partner that can provide us with optimum support—both now and in the future."

Packaging concept:
One carrying case for each deployment location, containing the installation material and all necessary tools.

Final preparations for the IPS 800: This inductive power supply delivers the needed energy to the OMS 840.

Installation of the OMS 840 and the OMS 800
at the switching station in Rowdown.

OMICRON monitoring system

A typical three-phase system for capturing partial discharge, consists of three MCT 110 HFCT sensors, one OMS 840 data capture unit with three channels and one OMS 800 data concentrator. Two to four OMS 840 units are typically connected to one OMS 800 via fiber-optic cable. These units process the measured values and forward them to a server via further, redundant fiber-optic connections. The data from the monitoring software is then available for visualization, evaluation and further processing in the monitoring center.