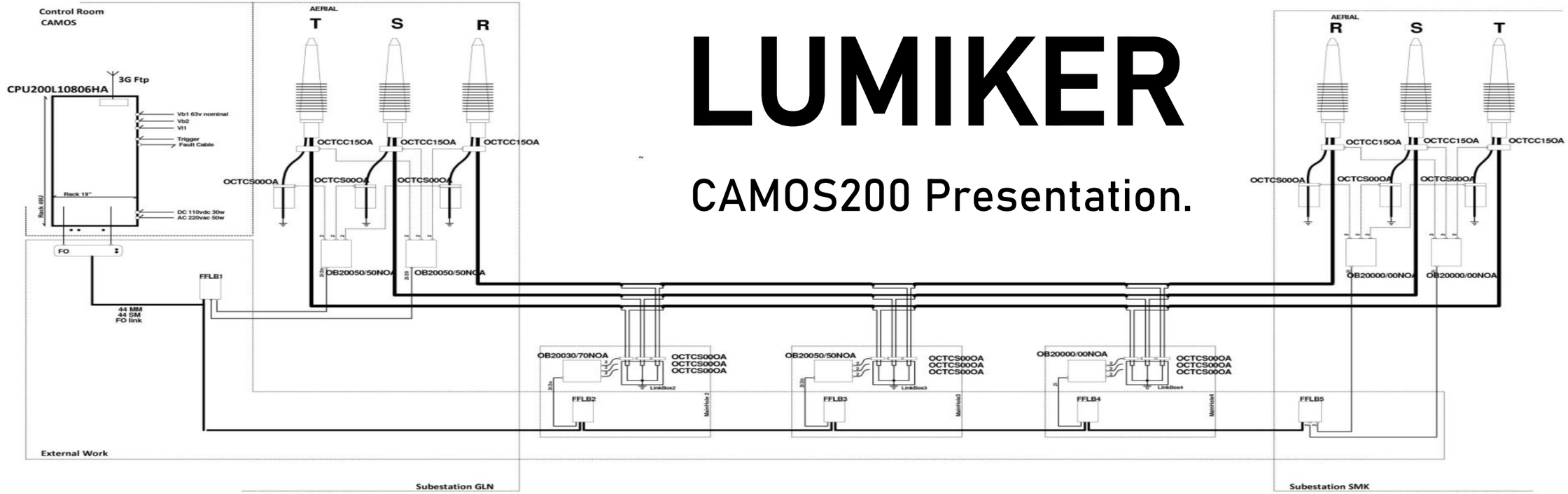
LUMIKER

CAMOS200 Presentation.



CAMOS CAble Mannagment Optica System	Rack Optical - Electronic part
OPxxx	Optical Part. Optical element for OCT
OCT	Optical Current Transformer
FFxx	Fiber Fusion

Camos GLN-SMK

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We are a company formed by industrial and telecommunications engineers with experience in the **electrical sector.** For several years we have been investigating the different sensor technologies **in optical fiber** as **Faraday, Bragg, Brillouin, Raman and Rayleigh.**

We have multiple patents that allow us to obtain real time measurements of any asset, and have developed different **Continuous Monitoring Solution**

Three years ago, we developed CAMOS for high voltage cables being the first company in the world to locate, predict and discriminate faults by monitoring cable variables.

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Mission & Vision

- ✓ Society to be more efficient in Energy Management by using Photonic Systems.
- ✓ Improve Costumer OPEX with the best Asset Digital Monitoring Technology.
- ✓ Transfer Knowledge to our ecosystem with our turnkey Optic, Sensing and Electronic Solutions.

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LUMIKER HV Cable Monitoring Optical System

Characteristics of HV (from 36KV) Underground networks Operation and Maintenance

Lack of Integrated Predictvie, Preventive @ Corrective Monitoring Systems

Maintenance of HV Underground Lines is performed with high cost field tests, involving live-line dangerous tasks, and system outages. The lack of continuous monitoring leaves unfound faults which in turn increase corrective repair costs & prolonged outages.

Expensive Infrastructure, Repair & Logistics

HV Underground Infrastructure requires heavy capital investment, repairs have complex and dangerous access and are expensive. On many occasions the fault location is not identified and line turndown occurs during undesirable periods of time!

Long Life vs Difficulty of Inspection

HV Underground cables together with their communication elements, are designed to operate over several decades without the possibility of periodic visual inspections.

Monitoring Complexity vs Critical Components

Monitoring for the detection of effects such as corrosion, damage or wear of the cable insulation or located in a connection, switchgear or terminal points is very complex & very difficult to perform using actual practices.
A power outage is normally the first indicator of failure!

Risks due To External Agents

In addition to the risk of a failure in the facility due to a fault in the cable or its critical elements there is also a high risk derived from external factors caused by third parties or weather events such as water ingest, high operating temperature, excessive stress of the conductor, vibrations of the components....

These are Critical Facilities

Underground HV Cables normally supply critical facilities, utilities or consumers, hence it is vital to have a rapid detection method to accurately identify the point on the cable where the fault has occurred, and discriminate the part to be able to reclose if it has occurred in the aerial segment.

Monitoring @ Prevention

In order to reduce Preventive and Corrective Maintenance costs, avoid unnecessary dangerous human tasks, increase line availability and improve the quality of power delivery it is recommendable to introduce real-time monitoring systems, tha can locate and discriminate faults and easily installed in existing or new cables.

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Cable Monitoring Optical System

Digitalisation and Advanced Monitoring for HV Underground networks using Optical Current Transformers.

Main technical features of the new proposed solution based on Optical Current Transformers

Technology based on optical current transformers **can be applied in three areas (predictive maintenance, fault discrimination and fault localisation and pre-localisation).** In any of the applications, **the technology uses the same type of components: a processing unit (CPU), a series of optical current transformers and a series of multiplexers.** Additionally, in all cases, **the partial and optimised use of fibre optics as a system element is required,** through which **the interrogator located in the processing unit sends pulses of light, which are modified by the transformer and returned to the processing unit.**

Processing unit

This is the **component in charge of processing the information from the optical current transformers**, in order to show the results to the network manager so that continuous knowledge of its status is provided.

Optical Current Transformers

These elements **make it possible to capture the information on the state of the cable by measuring the nominal current of the cable or the current of the screens.** These are passive elements that send the information to the processing unit through the optical fibre.

Multiplexer

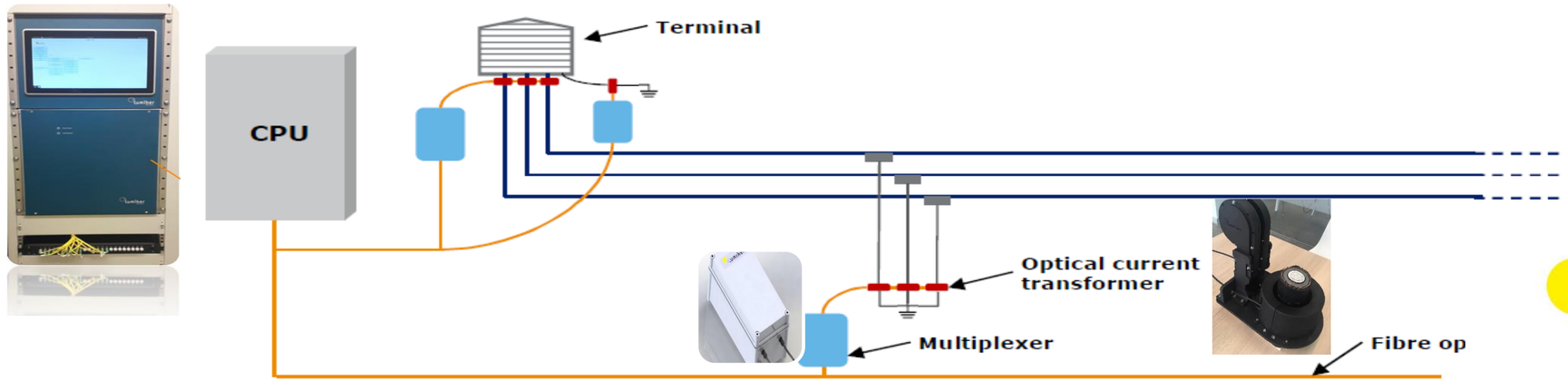
Passive elements that allow for different optical current transformers to be shared on the same fibre, minimising the use of optical fibre.

Ability to offer a comprehensive solution ✓

Efficiency in terms of time and costs ↑

Risk to physical safety ↓

Accuracy in locating the fault ↑



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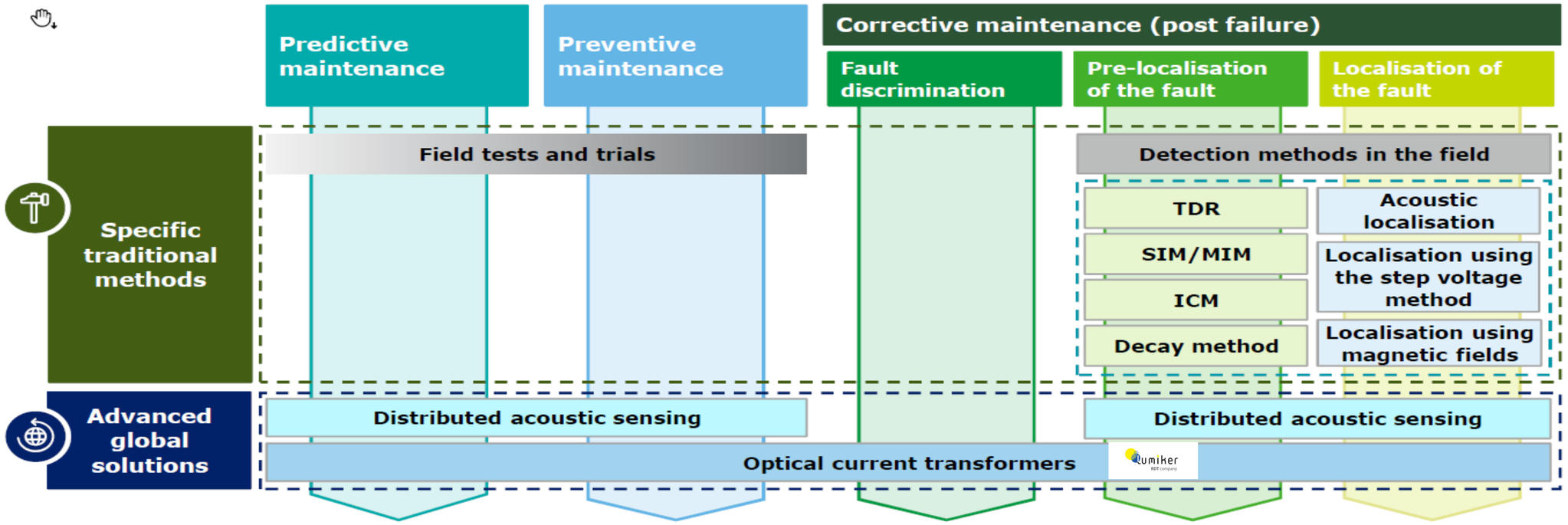
Benchmark of Advanced Monitoring for HV Underground networks using Optical Current Transformers.



Traditional maintenance solutions are typically preventive and are based on carrying out **routine on-site checks** on the section of the underground cable, which enables preventive detection of certain insufficiencies in the state of the facility. In the **post-failure area of action, traditional corrective maintenance is based on a field visit and a pre-localisation and long-term localisation process.**

Certain more advanced solutions allow for continuous monitoring of the condition of the underground cable, as well as differentiation, pre-localisation and localisation of the fault, without the need to deploy maintenance teams, thereby reducing cost and increasing security.

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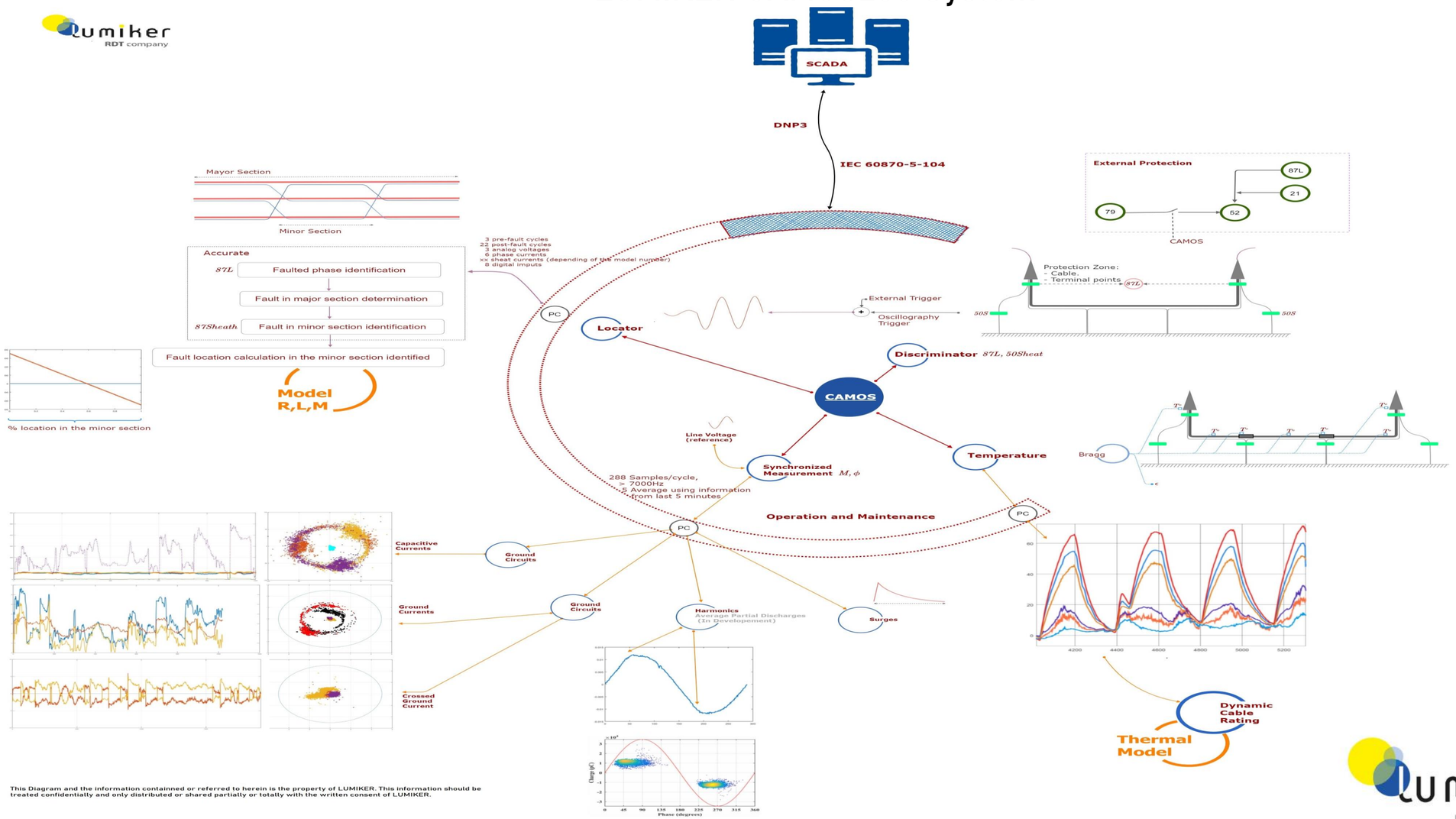
Cable Monitoring Optical System

LUMIKER CAMOS200 System



CAMOS200

Cable Monitoring Optical System

CHARACTERISTICS FROM LUMIKERS CAMOS 200 SYSTEM.

Predictive Maintenance

It uses the currents flowing through the cable screens as a reference. These screen circuits run right along the cable, so they can provide information about its state thereby making possible to:

- ✓Measure Ground Circuit Integrity, Cable Ground and Capacitive Currents (Module, Phase), Surges, Analyse Harmonics, Include Dynamic Cable Rating (Temperature).
- ✓Obtain Real-time information on the state of operation of the cable storing it on the Clients Cloud or SCADA System (69870-5-104).
- ✓Anomalies Identified can originate actions in planned preventive maintenance tasks, and correct the operational and regulatory conditions before a Real Fault occurs.

Fault Pre-Location, Location & Discrimination

- ✓Its facilitates discrimination in the mixed lines & whether the fault originates from the aerial or underground section.
- ✓This solution enables the reclosers to act as long as the fault occurs in aerial sections & avoids reclosing in the event of a fault in the underground section. In this way any line downtime due to ignorance of the real origin of the fault is reduces.
- ✓It makes it possible to pre-localise the area where the fault is located on a realtime basis.
- ✓With further analysis the solution allows to locate the exact point (if an impedance model is available).
- ✓The solution determines, sequentially, (i) the fault phase, (ii) the minor and major part, and (iv) the fault point.

Other

- ✓Add Value to Existing Facilities through Digitalisation using Real and Precise Data.
- ✓Integration of All Measures in the same System.
- ✓Greater Data Capture Frequency 7000Hz which allows to sense Partial Discharges when the fault is critical.
- ✓Safe and Direct Data Handling Connection to Cloud or SCADA interfaces.
- ✓Passive Sensors, that do not require additional power sources.
- ✓Monitoring of Wave-Quality through the measurement of harmonics to enhance a smooth integration of Renewable Energy technologies.

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ADDITIONAL CHARACTERISTICS FROM LUMIKERS CAMOS 200 SYSTEM.

Optimises de use of fiber optic: LUMIKER technology makes it possible to reduce the use of existing fibre optics, through the installation of multiplexers that increase the number of optical transformers connected at the same time.

Optical Transformers (OCTs) have been designed to be aesthetic and small, hence easily installed during the construction of the facility or after.

The Product is Standardized and Modular: The system consists of 3 elements (Processing unit, Optical Current Transformer and Multiplexers), the number and placement can be adapted depending on the specific needs and characteristics of each site.

The system is passive and designed to last the same life as the facility not requiring any additional Maintenance Task.

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BENEFITS FROM LUMIKERS CAMOS 200 SYSTEM.

Increase the Resiliency and Maximise the Utilization of the Electrical Network.
Allows to measure theeffect of aggregates (Intensity and Voltage) in order toupkeep the cable functionality.

Minimises the need of preventive maintenance and the need for periodic field tests.
This avoids the movement of personnel to the facility hence greater efficiency is achieved in terms of costs and time.
Reduces the risks of physical safety due to Current Leakage, and Direct Cable Handling.

Revenues Increase: This Solution is valid to demonstrate optimum management of the electricity networks, both in terms of transmission and distribution for regulatory methodologies introduced in different European Countries. Its contribution to the generation of efficiencies that consumers may Benefit from provides a complementary tool for remuneration mechanism to increase incentives that enhance quality of supply and reduction of losses.

Europe 20230 and post-COVID-19 Commission's Objectives are aligned with the digitalisation, electrification and recovery of a “Greener, Digital and more Resilient Europe”. Makes funds accessible to the companies that invest, install & utilize this system.

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Take Away

Solution Economic Efficiency:

- ✓ Reduces Maintenance Costs, excavation tasks, and the need to replace facilities as a lack of predictive/preventive maintenance.
- ✓ Increases the Remuneration for the sale of Energy.
- ✓ Increases the Accessible Funds for Grid Developments.

Additional Grid and Supply Security:

- ✓ Reduces the Number of field trips and manual live-linve works.
- ✓ Reduces time require to localise faults.
- ✓ Reduces errors associated with the use of multiple pieces of equipment.

Quality and Continuity of Supply:

- ✓ Reduces Line Outages, and the number and time of Interruptions.
- ✓ Improves resiliency and efficiency of power supply.
- ✓ Reduces the time to find and discriminate faults.

Digitalization and Knowledge Creation:

- ✓ Real-Time Remote Monitoring minimises the number of trips to the facility.
- ✓ Increase in real-time information on the status of the facility.
- ✓ Data Storage and Treatment Encourages innovation for the development of new technologies for new network integration solutions.

Environmental, Decarbonization and Efficient Electrification:

- ✓ Reducing additional greenhouse gas emissions, and waste associated with additional electrical equipment
- ✓ Increase in the information related to wave quality aiding the integration of renewable sources.
- ✓ Contributes to the development of additional underground networks that reduces isolated systems dependence on fossil fuels.

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Customers

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