



Solutions for

# Electrical Utilities

Generation,  
Substations,  
Transmission,  
Distribution,  
HVDC, Renewable  
Energies



# OFIL's Solutions for Electrical Utilities

Electrical utilities face growing challenges in maintaining aging infrastructure, meeting reliability standards, and preventing costly outages. With thousands of kilometers of lines and hundreds of substations to monitor, identifying faults before they escalate is critical. Utilities need smart ways to prioritize maintenance, ensure safety, and optimize resources in an increasingly complex grid environment.

OFIL supports this mission with **inspection solutions** designed to meet the evolving needs of electrical utilities. OFIL's Solar Blind UV inspection technology enables early detection of corona partial discharge and arcing - critical faults that are invisible to the naked eye and often go unnoticed. Engineered specifically for electrical infrastructure, OFIL's UV corona cameras help identify problems before they escalate.

**The cameras are available in a range of configurations, including handheld, UAV-mounted, vehicle-mounted and robot-integrated platforms.**



## Gridnostic

Gridnostic, OFIL's data management platform, is an advanced **diagnostic solution** that leverages multi-sensor technologies, including **Visible, Thermal and UV**, and converts complex imagery data into clear numeric severity scores. Gridnostic was developed based on research and guidelines from the Electric Power Research Institute (**EPRI**)



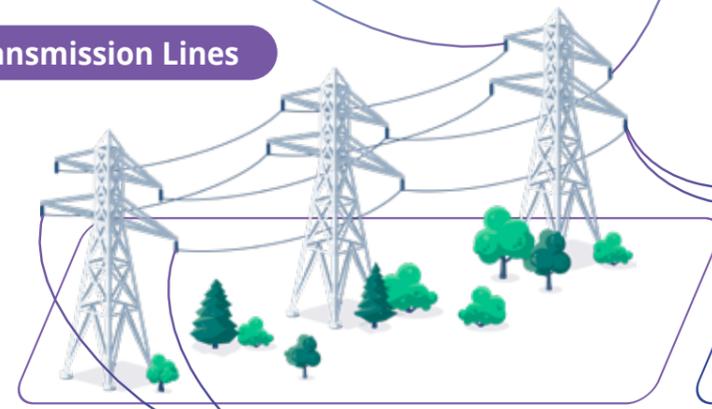
# End-to-End Inspection & Diagnostic Solutions for Electrical Grid Reliability



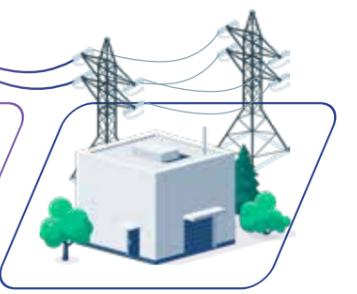
### Generation Power Plants & Renewable Energies



### Transmission Lines



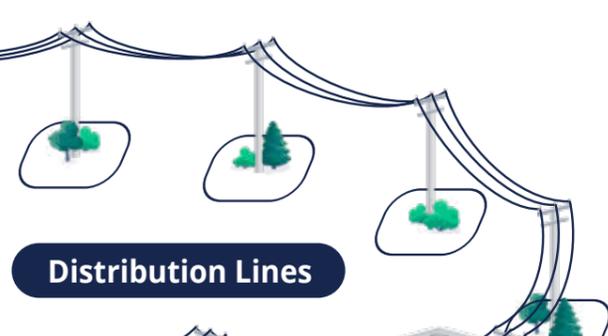
### HVDC Converter Halls



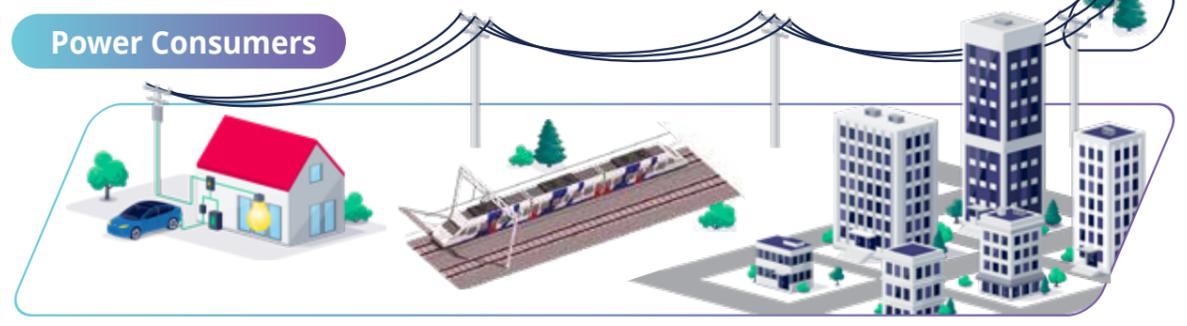
### Substations



### Distribution Lines



### Power Consumers

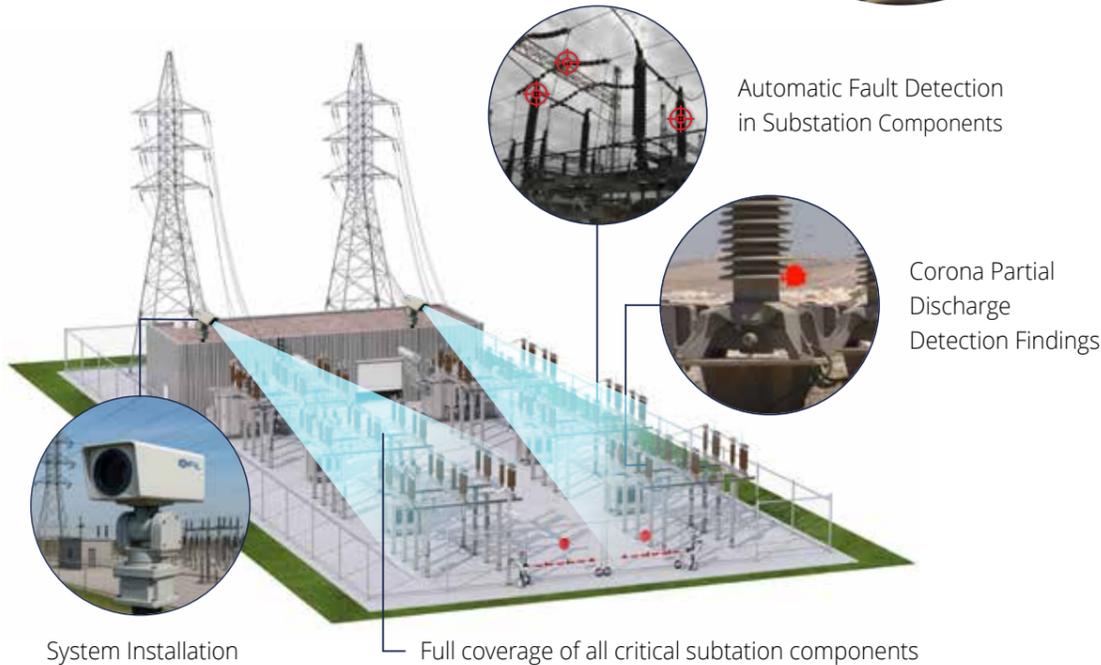


# Substations



Substations are key points in the power grid, converting voltage levels for safe and efficient distribution. Components like transformers, circuit breakers, insulators, capacitors, switchgear and conductors are prone to corona PD, often caused by aging, contamination, or installation issues. If not repaired, PD related issues can lead to failures and costly outages.

OFIL's UV cameras enable early detection of corona PD through both handheld inspections and continuous monitoring solutions tailored for substations. This helps reduce downtime, lower repair costs, and maintain grid reliability.



By using Gridnostic in substations, utilities can centralize inspection data from UV, thermal, and visual cameras across all critical assets. The platform helps teams prioritize repairs, improve maintenance planning, and ensure safe, reliable substation performance.

# Substations



## Switchgear

In switchgear systems, weak points for corona PD activity commonly include cable insulation, terminations, and electrical connections. These areas are particularly susceptible to degradation and partial discharge due to tight spacing, sharp geometries, and elevated electrical stress. OFIL's UV cameras provide a reliable, non-invasive method for detecting early-stage corona PD in these critical components - supporting safer operations, reducing downtime risk, and enabling predictive maintenance without interrupting service.



## Case study

### The Challenge:

- Transformer bushings are critical for substation functionality.
- Bushings contribute to 17% of transformer failures. Such failures can escalate to explosions or fires within substations.
- Utilization of continuous monitoring corona camera in a substation identified corona discharge on bushing transformers.
- Analysis confirmed compromised integrity of the bushing insulation.
- Implications of Non-Intervention:
  - Increased risk of catastrophic transformer failure.
  - High replacement cost for transformers due to failure.
  - Additional risk factors: potential substation explosions and fires.



### The Outcome:

- Proactive replacement of the bushing to prevent transformer failure.
- Cost of proactive bushing replacement: (including bushing replacement and monitoring): **\$11,000**
- Cost of transformer replacement:
  - **\$1,000,000** (in case of a failed transformer)
  - ~2-year waiting period for a new transformer



## Power Generation



Power generation facilities are vital for delivering electricity to millions and rely on a complex network of components. The complexity of these systems presents significant challenges in ensuring both safety and reliability.

### Generation Switchyard

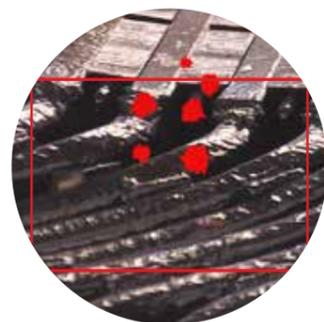
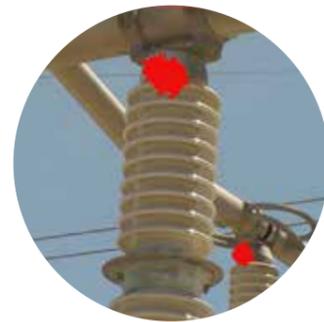
Corona PD is a common issue in generation power plant switchyards, often caused by aging components, defects, improper installation, or contamination. If left undetected, PD can lead to failures, equipment damage, and costly unplanned outages.

OFIL's UV cameras play a critical role in identifying corona PD at an early stage in key switchyard components such as transformer bushings, insulators, and conductors. Detecting these issues early allows utilities to implement predictive maintenance strategies that reduce outages, enhance safety, and support the reliable operation of power generation sites.

By using Gridnostic, utilities can centralize inspection data - whether from UV, thermal, or visual cameras, quantify fault severity, and make informed maintenance decisions that extend asset life and improve operational efficiency.

### Electrical Generators

Early detection of partial discharge in electrical generators is vital, especially in stator windings where insulation breakdown can lead to severe failures. Using UV inspection to identify external PD helps uncover early signs of winding degradation, enabling timely maintenance that prevents costly downtime and extends the life of critical generation equipment.



## Transmission Lines



Transmission lines often rely on aging infrastructure that is increasingly vulnerable to faults. These lines span vast, remote areas and are exposed to harsh environmental conditions, contamination, and mechanical stress.

OFIL's UV cameras detect UV emissions from corona PD activity that indicate early-stage faults - especially in degraded or damaged insulators, conductors and connectors. By identifying these issues early, utilities can address problems before they lead to failures, reduce the risk of widespread outages, and support predictive maintenance strategies that extend asset life and reduce operational costs.

For transmission lines, Gridnostic allows utilities to centralize inspection data collected from UV, thermal, and visual cameras - even across vast, remote areas. By analyzing this data and assigning severity scores to faults, the platform helps prioritize maintenance efforts based on actual risk.

### Case study

#### The Challenge:

- Routine UV camera inspections revealed corona partial discharge on transmission line insulators, indicating potential failure points.
- UV cameras pinpointed PD sites on insulators, signifying insulation breakdown risks.
- A closer review suggests significant deterioration in the insulator condition.
- Analysis showed these insulators were compromised due to environmental wear and age.

#### The Outcome:

- Immediate replacement of affected insulators.
- Implementation of regular PD monitoring across the network with UV cameras.
- Cost Considerations:
  - Cost of emergency interventions and outages: **\$70,000** per incident.



# Distribution Lines

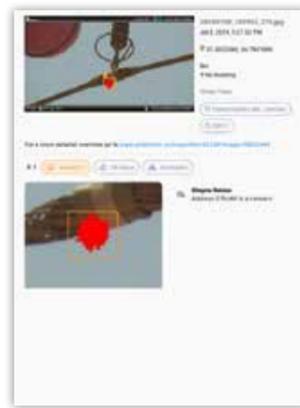
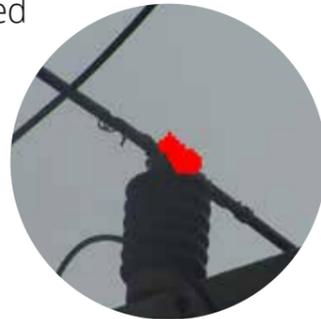


Distribution lines are the final stage in the power delivery process, delivering electricity from substations to homes, businesses, and essential services. Components such as insulators, conductors, connectors, and switches within these networks are potential sources of corona PD faults.

Corona PD on distribution lines can lead to localized outages, safety hazards, and equipment damage - especially concerning in residential areas where there is typically no redundancy. PD may also generate radio interference and audible noise, disturbing nearby communities.

OFIL's UV cameras enable real-time detection of corona PD, allowing precise fault localization without interrupting service. This proactive approach supports predictive maintenance, helping utilities reduce unplanned outages, improve public safety, and ensure reliable power delivery across distribution networks.

With Gridnostic, utilities can centralize inspection data from UV, thermal, and visual sources across the distribution network - turning field findings into actionable insights.



# Distribution Lines



## Case study

### The Challenge:

- As part of periodic maintenance, an inspection was performed utilizing UV corona cameras for early detection.
- Corona discharge was detected on two phases of a distribution line tower.
- This discharge is located at the live end of the insulators, indicating that there is a significant risk to the insulator.
- Persistent corona discharge on the insulator leads to the formation of acid, which severely damages the insulator and its hydrophobic coating.
- This degradation increases the risk of insulator failure, particularly under conditions of high humidity or wet weather.

### The Outcome:

- The early detection allowed for planned maintenance and replacement of insulators during scheduled outages, significantly reducing the risk of unexpected failures and power outages.
- Cost of preventative insulator replacement:  $\$500 \times 2 =$  **\$1,000** for two insulators during a scheduled outage, avoiding the emergency cost.
- Savings from avoiding power outage: **\$25,000** saved by preventing a 2-hour outage.
- Savings due to avoided downtime penalty: up to **\$32,000**

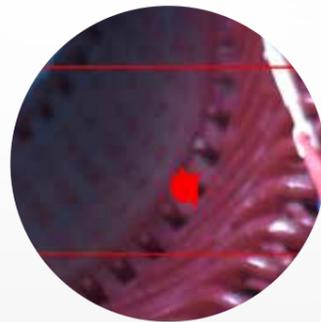
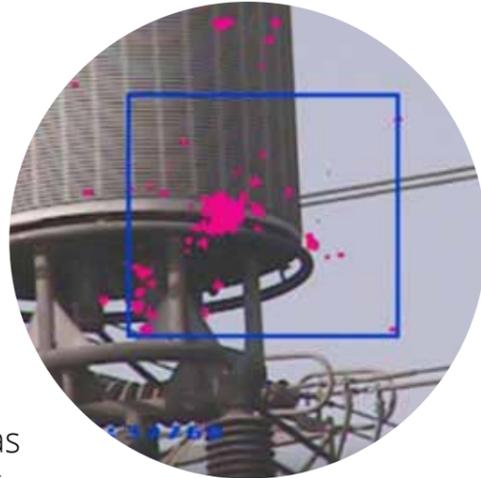




## Renewable Energies

Renewable energies are at the heart of the global transition to cleaner power, making their reliability and integration into the grid more important than ever. Whether solar, wind, hydro, or geothermal, all renewable sources must connect to the power grid through substations and power lines. These connection points include step-up transformers, reactors, insulators, and conductors - components that are susceptible to corona PD. OFIL's solar-blind UV cameras enable accurate, real-time inspection of these assets to detect early-stage faults and prevent failures.

**Generators** in hydro, wind, and geothermal installations are inspected for corona PD activity in their insulation systems, supporting predictive maintenance and ensuring the dependable operation of renewable energy systems.

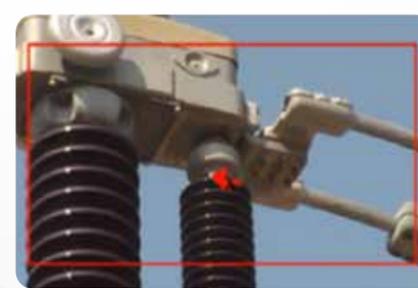


## HVDC Substations and Converter Halls



HVDC substations and converter halls are essential for the efficient transfer of electricity across long distances. To maintain performance and ensure safety, it is crucial to monitor corona PD in key components such as transformers, bushings, insulators, conductors, and reactors.

These environments are often difficult or unsafe for personnel to access, making remote inspection solutions a necessity. OFIL offers a range of UV camera options including handheld devices, robot-mounted systems, and fixed installations. Each solution is designed to provide accurate detection and continuous monitoring of corona PD activity across HVDC infrastructure, helping utilities prevent failures and maintain reliable operations.





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