SEPTEMBER 2025

www.ofilsystems.com
solution@ofilsystems.com

OFIL SYSTEMS

NEWSLETTER

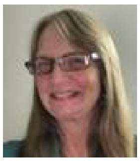
In this newsletter:

[Previous Newsletters]

ECCE 2025
IEEE ENERGY CONVERSION CONGRESS & EXPO PHILADELPHIA, PA, USA OCT. 19-23

OFIL to lead a full-day tutorial at IEEE ECCE

The tutorial, titled "**Rotating Machines: Insulation and Partial Discharge Inspection**," will be delivered by:



Dr. Nancy Frost
Dielectrics Engineer at Frosty's Zap Lab, LLC

Eran Frisch
CTO at OFIL

More information and registration

OFIL to Present at INMR 2025: "AI Diagnostic Solution & Integration to UV Technology"

At the upcoming INMR World Congress 2025 in Panama, Amit Ashkenazi of OFIL will highlight how ultraviolet (UV) imaging, enhanced with AI-assisted detection, transforms partial discharge inspections from subjective interpretation into automated, data-driven diagnostics. Amit will also demonstrate how integrating AI with UV platforms enables structured severity evaluation and supports risk-based asset management, ultimately strengthening grid reliability.

Commissioning with Confidence: UV camera Advantage

Why Commissioning Matters

Commissioning marks the critical moment when a new electrical installation is tested before being energized. For utilities, this process is more than a formality; it is the safeguard against faults that could lead to costly failures, reputational damage, or safety hazards. Detecting issues at this stage ensures electricity is delivered reliably to customers from day one and that contractors hand over a project that meets expectations.

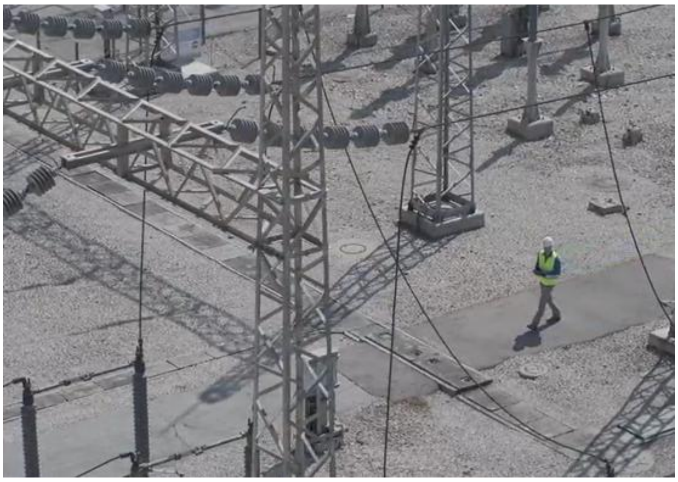
The Hidden Challenges in New Installations

Although newly built substations, transmission lines, and switchyards are expected to be flawless, experience shows otherwise. Faults can appear for multiple reasons. Some are rooted in inadequate design, such as cables with improper diameters, insufficient clearances between phases, or mismatched grading rings. Others originate in the supply chain, where defective batches escape quality control or where perfectly fine components become damaged during shipment and handling. Finally, the commissioning process often reveals installation errors, including missing parts, incorrectly mounted hardware, or mismatched components.

These hidden risks may not be visible during standard visual inspections. Yet, if left unresolved, they can compromise the reliability of the entire system, trigger premature equipment failure, and in severe cases, put both operators and assets at risk.

Uncovering Hidden Risks Through UV Detection

This is where UV camera technology plays an indispensable role. OFIL's solar-blind ultraviolet cameras are designed to reveal corona and arcing activity that cannot be seen with the naked eye. During commissioning, they allow inspectors to pinpoint the exact location of electrical stress, whether it stems from poor design, damaged equipment, or improper installation.



Unlike general-purpose testing tools, UV camera offers direct visual confirmation of faults in real time. This immediate feedback enables contractors to fix problems on the spot, often before warranty periods expire, while utilities gain assurance that their systems are being energized in optimal condition.

Case Studies

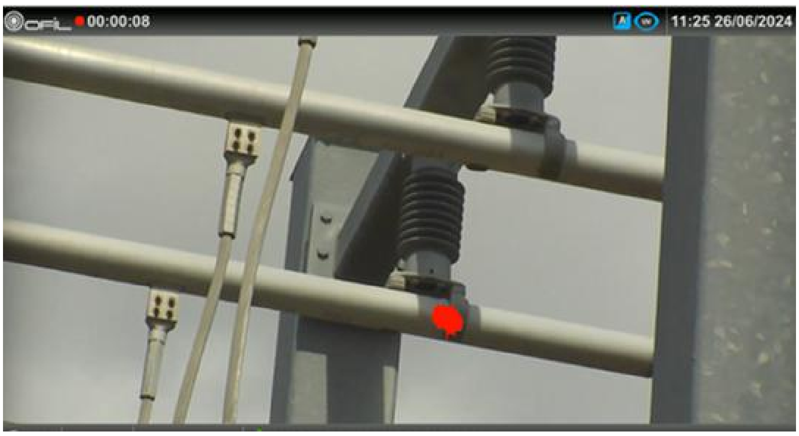
The following case studies highlight how ultraviolet (UV) inspection plays a decisive role in uncovering hidden defects during commissioning of high-voltage assets. Each example demonstrates how early detection prevents long-term reliability issues.

Case Study 1: Spacer Failures

A European utility deployed the micROM UV camera on a drone during commissioning of a newly built transmission line. Multiple cases of corona activity were detected online spacers. The root cause was traced to improper installation and debonding. If left unresolved, such discharges can gradually weaken conductors and increase the risk of mechanical failure. The systematic nature of these findings revealed widespread defects across nearly all spacers on the line.

Case Study 2: Misaligned Insulator Clamp

A critical substation was undergoing commissioning when inspectors detected a misaligned insulator clamp on a busbar. The incorrect installation left an air gap, causing partial discharge and localized arcing at the clamp connection. This type of defect reduces reliability and, if not corrected, can compromise system performance.



Case Study 3: Improperly Installed Corona Ring
In a substation commissioning inspection, a grading ring was mounted incorrectly, leading to intense discharge and arcing between the insulator and the ring edge. This improper installation compromised insulation integrity and posed an immediate risk of accelerated degradation.

Case Study 4: Missing or Misaligned Corona Rings
As part of a contractor-led substation commissioning, UV inspections compared three bushings side by side. Those without corona rings displayed heavy corona activity at the top, while the one with a properly installed ring remained clear. Missing or misaligned rings were found to be more frequent than expected, and UV cameras are means of detecting them.

Baseline Today, Insight Tomorrow

The benefits of using UV cameras during commissioning extend well beyond the initial energization. By capturing the condition of assets from their very first day in service, utilities establish a clear and uncontaminated baseline for ongoing maintenance. This benchmark serves as a trusted reference point for all future inspections, enabling teams to detect subtle changes in equipment behavior and to track degradation trends over time.
When combined with Gridnostic, these baseline recordings gain even greater value. The data is securely stored, geo-tagged, and linked to each asset's digital record within the platform. Future inspection results—whether from UV, thermal, or visual sensors—can then be compared directly against the commissioning baseline. This creates a structured history of each asset's condition, turning raw inspection files into actionable insights that support predictive maintenance, risk assessment, and long-term asset management strategies.

A Foundation for Long-Term Reliability

Commissioning is not only about passing a test; it is about securing the future performance of the grid. With UV technology integrated into the process, utilities can move forward with confidence, knowing that the installation has been thoroughly checked, faults have been eliminated, and the system is ready to serve reliably for years to come.

Partial Discharge Risks in Switchgear: Causes, Consequences, and Detection

Switchgear is one of the most critical elements in electrical networks, responsible for protecting, isolating, and routing power circuits. Beginning with medium-voltage levels, typically from 11 kV and upwards, these systems are exposed to conditions that make them vulnerable to partial discharge. Their reliability depends on the integrity of key components such as terminations, bus bars, cables, insulators, and connections. When any of these are subject to defects, contamination, or improper assembly, localized high electric fields can develop and trigger PD activity.

How PD Develops in Switchgear

Inside switchgear, PD can be initiated by several conditions:

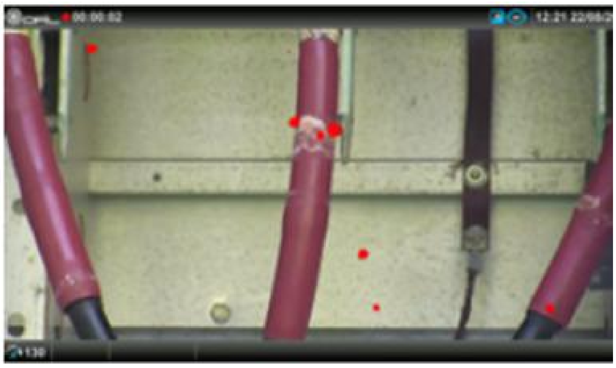
- **Cables and Insulation** – Defects in insulation, voids at terminations, or contamination accelerate degradation and carbon tracking.
- **Bus Bars and Joint**s – Inadequate spacing, loose fittings, or mismatched hardware lead to PD activity.
- **Terminations and Connections** – Sharp edges, improper torque, or poor surface finishing create points of high stress where corona PD can form.
- **Environmental Conditions** – Humidity, dust, or residual cleaning agents increase conductivity along surfaces, supporting PD growth.

Once PD occurs, it erodes insulating material, leaves conductive paths, and produces byproducts such as ozone, nitric acid, or white powdering. Over time, this leads to deep carbonization, loss of dielectric strength, and eventually flashover or catastrophic failure.

Case Study: Utility Switchgear Failure

A European utility encountered widespread failures in their switchgear. An extensive inspection using a UV corona camera revealed that approximately 30% of the equipment, around 10 years in service, exhibited PD. As seen in the image, corona activity appeared as bright spots along the center cable, with high PD resulting in repeated line tripping.

The failures were initially attributed to extreme cold weather, but subsequent investigation determined that improper cable installation had induced partial discharge activity within the insulation. This accelerated aging of the dielectric material and ultimately caused insulation breakdown and line tripping.



The Value of PD Detection

Traditional inspections often miss early-stage PD because it is invisible to the human eye. Ultraviolet cameras allow operators to visualize corona activity directly, pinpointing its exact location. By identifying PD at an early stage, utilities can:

- Correct workmanship issues before they escalate.
- Prevent insulation breakdown and unplanned outages.
- Establish a baseline for condition monitoring.
- Extend the service life of critical equipment.

Gridnostic and the Science of Severity: A New Way to Assess Asset Risk

At the heart of the Gridnostic platform lies the Severity Diagnostic Methodology - a structured way to transform inspection data into objective, prioritized insights that utilities can rely on.
Utilities are under constant pressure. On one side, aging assets and rising demand strain reliability. On the other, regulatory requirements and limited budgets demand smarter, more strategic decisions. Asset managers must decide: **which components need urgent attention, which can be scheduled for later, and which are safe to monitor?**
The challenge isn't the lack of data - modern inspections capture huge amounts of imagery from UV, thermal, and visual sensors. The challenge is transforming that raw data into consistent, objective, and actionable insights. That's exactly what Gridnostic's methodology is designed to do.

From Subjective Impressions to Objective Scores

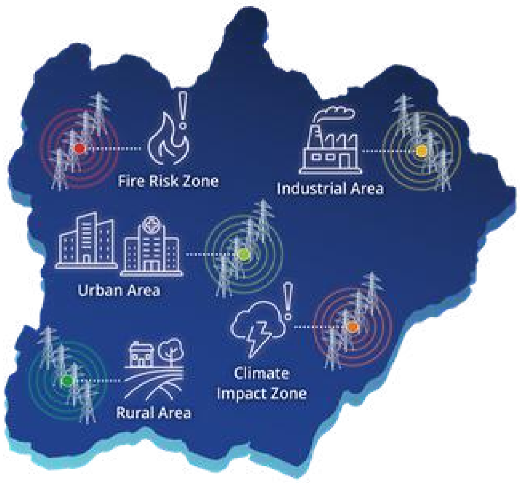
Traditionally, interpreting inspection imagery has been highly subjective. Two inspectors looking at the same image could reach very different conclusions, influenced by their experience, expertise, or even the conditions of the day. Studies show that even the same inspector might score the same anomaly differently at different times.
Gridnostic changes this. Its Severity Diagnostic Tool provides a step-by-step interface that guides inspectors through structured evaluations, minimizing room for personal bias. AI co-pilot tools further support this process by assisting with image analysis, detecting relevant features, and suggesting classifications.
Most importantly, the tool translates qualitative observations into quantitative severity scores. **These scores are developed based on research and guidelines from the Electric Power Research Institute (EPRI).** The result is a standardized, repeatable process: imagery no longer produces scattered opinions, but reliable diagnostic data.

Beyond the Component: The Importance of Context

A defect on its own tells only part of the story. For example, a small crack on an insulator in a lightly loaded rural line may pose minimal risk. The exact same defect on a heavily loaded transmission line serving thousands of customers, however, could have serious consequences.
This is why Gridnostic's methodology integrates Asset Impact Parameters. These encompass tens of contextual factors that influence risk and prioritization — and the evaluation is performed entirely with AI.

Examples of such parameters include:

- Number of customers connected to the asset.
- Line redundancy and backup options.
- Regulatory and compliance risks.
- Environmental stressors such as pollution, fire risks, or salt exposure.



By automatically bringing this context into the analysis, Gridnostic ensures that condition scores are weighted against system-level consequences, giving utilities a reliable foundation for prioritization.

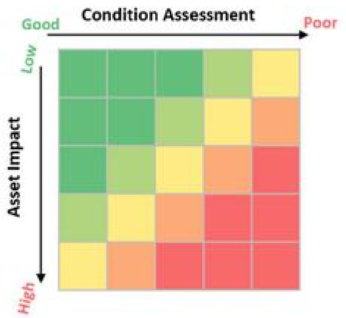
How It Works — Gridnostic Severity Scoring at a Glance

Component Condition Assessments

Inspection images from UV, thermal, and visual sensors are analyzed. A guided tool, supported by AI co-pilot features, converts subjective observations into consistent numerical scores.

Asset Impact Parameters

Dozens of contextual parameters are automatically evaluated with AI, including customer connections, redundancy, regulatory risks, environmental conditions, and more.



Combined Scoring

By merging condition data with impact parameters, the methodology delivers a clear **severity score and recommendations** helping managers prioritize repairs and plan maintenance with confidence.

Bringing Condition and Context Together

What makes Gridnostic's Severity Diagnostic Methodology powerful is the way it combines two perspectives into one outcome:

- The condition of the component, determined from inspection imagery and guided analysis.
- The impact of the asset, based on dozens of contextual parameters automatically evaluated by AI.

By merging these two dimensions, the methodology produces a severity score that reflects not only **how bad the defect is,** but also **how much it matters to the grid**.

This approach ensures that a minor anomaly on a critical asset is not overlooked, while less consequential issues are managed appropriately. The result is a clear, prioritized view of where maintenance efforts should go first.