MAY 2026

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OFIL SYSTEMS

NEWSLETTER

In this newsletter:

[Previous Newsletters]

[All Articles]

OFIL ACADEMY

Electrical Utilities Course

For electrical utilities, grid reliability is everything. Detecting and analyzing Corona Partial Discharge (PD) early can prevent costly failures and extend asset lifespan.
Gain industry-recognized UVographer Certification and take your expertise to the next level!

Location: USA
Date: June 2026

OFIL at IEEE PES T&D 2026

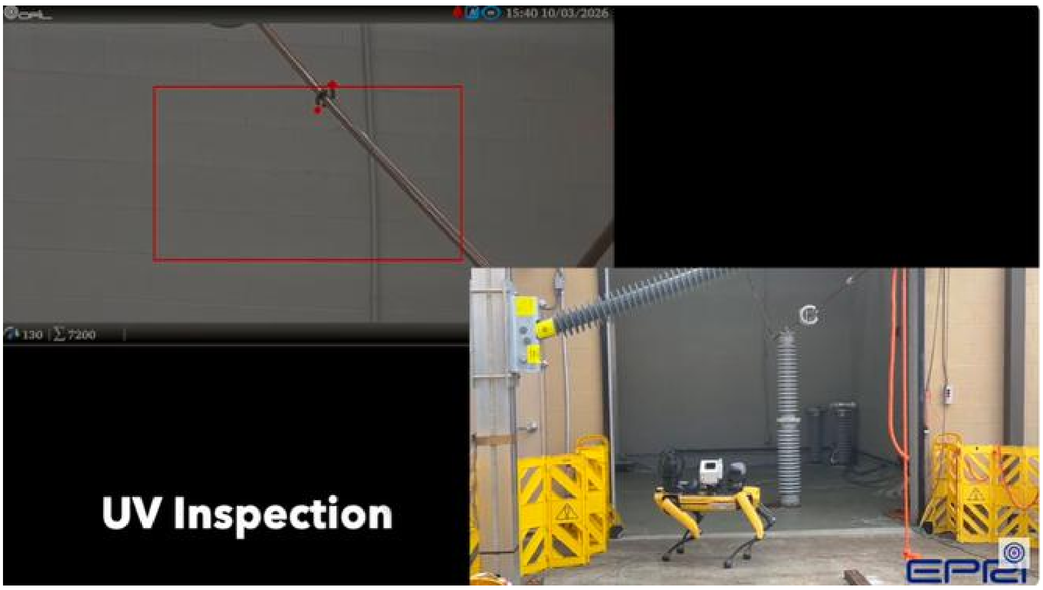
OFIL will participate in the IEEE PES T&D **we will introduce our partnership with FLIR Systems on the UAV R70 SkyRanger platform, as well as our collaboration with Movitherm, combining UV and IR technologies for integrated substation condition monitoring on ITL systems.**

Visit us at Booth 4615 to explore how our inspection and diagnostic solutions support the next generation of reliable and resilient power grids.

EPRI Advances Robotic Inspection with Integrated UV Corona Detection

Recent work by Electric Power Research Institute (EPRI) highlights the growing role of robotics in high-voltage inspection environments. As part of this effort, a UV EyeScope camera system from OFIL was integrated onto the Boston Dynamics Spot robot platform, alongside IR and RGB cameras, creating a multi-sensor inspection setup.

In a laboratory test conducted with a utility member in Charlotte, a 150 kV insulator assembly was evaluated using this integrated robotic system. Engineers were able to detect and localize a corona PD source within a high electric field zone, while the robot operated directly in the energized environment.

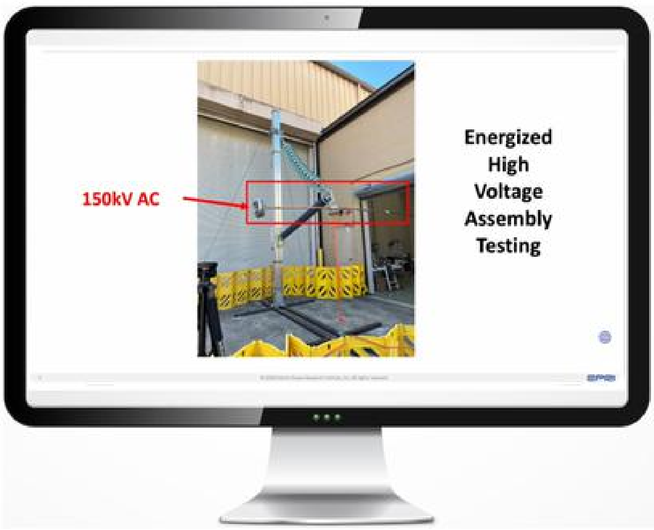


This approach enabled precise fault localization without requiring personnel to enter hazardous areas, demonstrating a clear improvement in both safety and operational efficiency. By combining robotics with solar-blind UV imaging, inspections can be performed more consistently while reducing exposure to high-voltage risks.

Beyond laboratory validation, this concept is highly relevant for utility substations, where access limitations and safety constraints often impact inspection quality. Electric Power Research Institute supports utilities in deploying these systems, either through utility-led implementation with integration support, or through fully managed deployment including procurement, validation, and initial operation.

In parallel, EPRI's Robotics Utility Network provides a collaborative framework for sharing field experience, best practices, and use cases, helping utilities accelerate adoption and standardize implementation.

As utilities continue moving toward condition-based maintenance and risk reduction, integrating robotics with UV corona detection presents a scalable and practical path forward.



Watch EPRI case study

What Happens Before the Hotspot? Understanding UV and Thermal Imaging in High-Voltage Systems

Electrical failures in high-voltage systems rarely originate from a single cause. Some develop from electric field stress, while others emerge from resistive heating under load. Understanding how these mechanisms evolve and how they are detected is essential for effective condition assessment.

Different Failure Mechanisms, Different Visibility

Electrical degradation follows multiple pathways. Voltage-driven phenomena such as corona partial discharge originate from localized electric field concentration, while current-driven faults arise from increased resistance and energy dissipation as heat.

Ultraviolet (UV) and thermal (infrared, IR) imaging technologies are designed to detect these different physical behaviors. UV imaging visualizes discharge activity associated with electric field stress, while thermal imaging identifies temperature rise caused by resistive losses.

Because each method responds to a different trigger, they provide fundamentally different insights into equipment condition.

Thermal Imaging: Detecting the Consequence

Thermal anomalies occur when electrical energy is converted into heat, typically due to increased resistance at conductive interfaces. Common causes include loose connections, degraded joints, overloading, and internal component deterioration.

A key limitation of thermal inspection is its dependence on operating conditions. Detectable heating requires sufficient load. Under light-load conditions, even significant defects may remain thermally invisible.

Thermal imaging therefore tends to identify faults at a stage where degradation has progressed to measurable energy loss.

Ultraviolet Imaging: Detecting the Origin

Ultraviolet inspection is based on a different physical principle. Instead of measuring heat, it detects light emitted during air ionization caused by high electric field intensity.

When localized electric field strength exceeds the dielectric strength of air, partial discharge occurs. This corona activity emits radiation in the ultraviolet spectrum and can be detected using solar-blind UV imaging, even in daylight conditions.

Unlike thermal anomalies, corona activity does not require load current. It can appear under no-load or light-load conditions, making it an indicator of early-stage electrical stress.

Beyond detection, corona activity contributes to material degradation through chemical processes such as ozone and nitric acid formation, which accelerate insulation aging and corrosion.

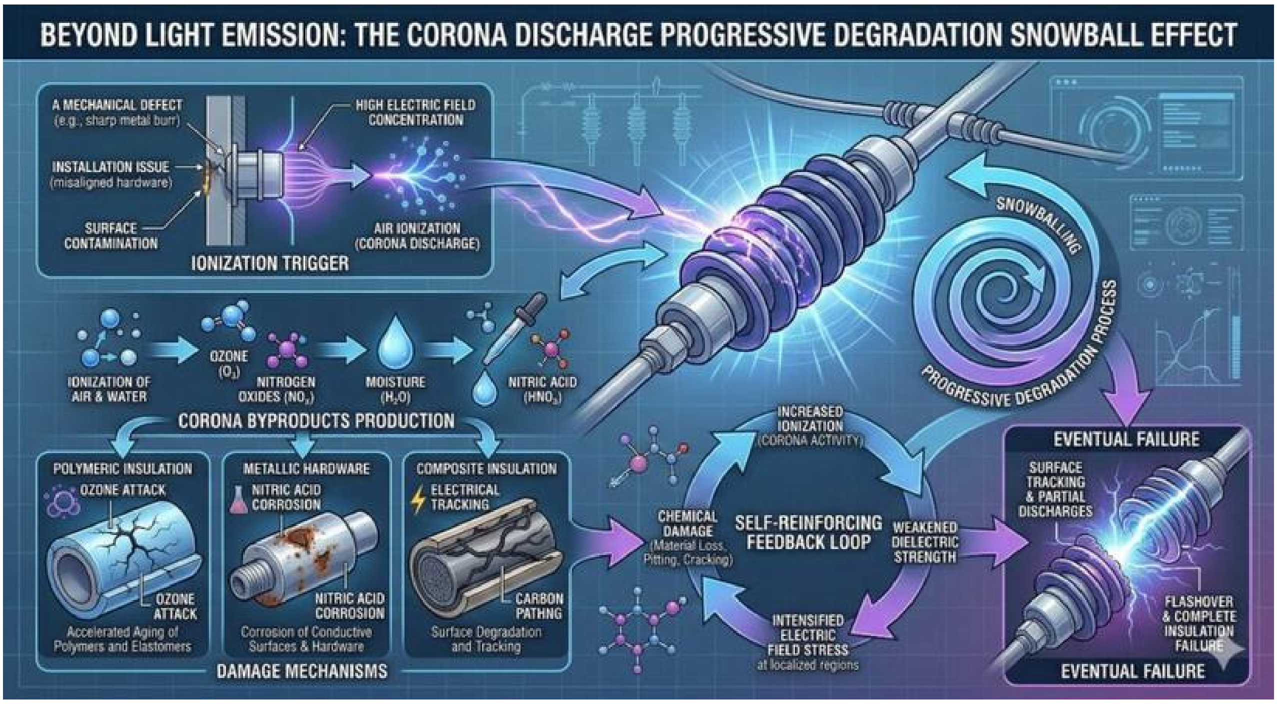
Failure Progression and Detection Timing

Electrical failures do not progress uniformly. Depending on the initiating condition, defects may first appear as electric field anomalies, resistive heating, or a combination of both.

In many cases, corona discharge is present before measurable heating develops. In others, resistive faults produce thermal anomalies without prior detectable discharge.

As degradation advances, mechanisms can overlap. Prolonged discharge may lead to surface tracking and heating, while resistive defects may alter geometry and intensify local electric field stress.

The practical implication is that UV and thermal imaging provide visibility at different stages of the failure process.

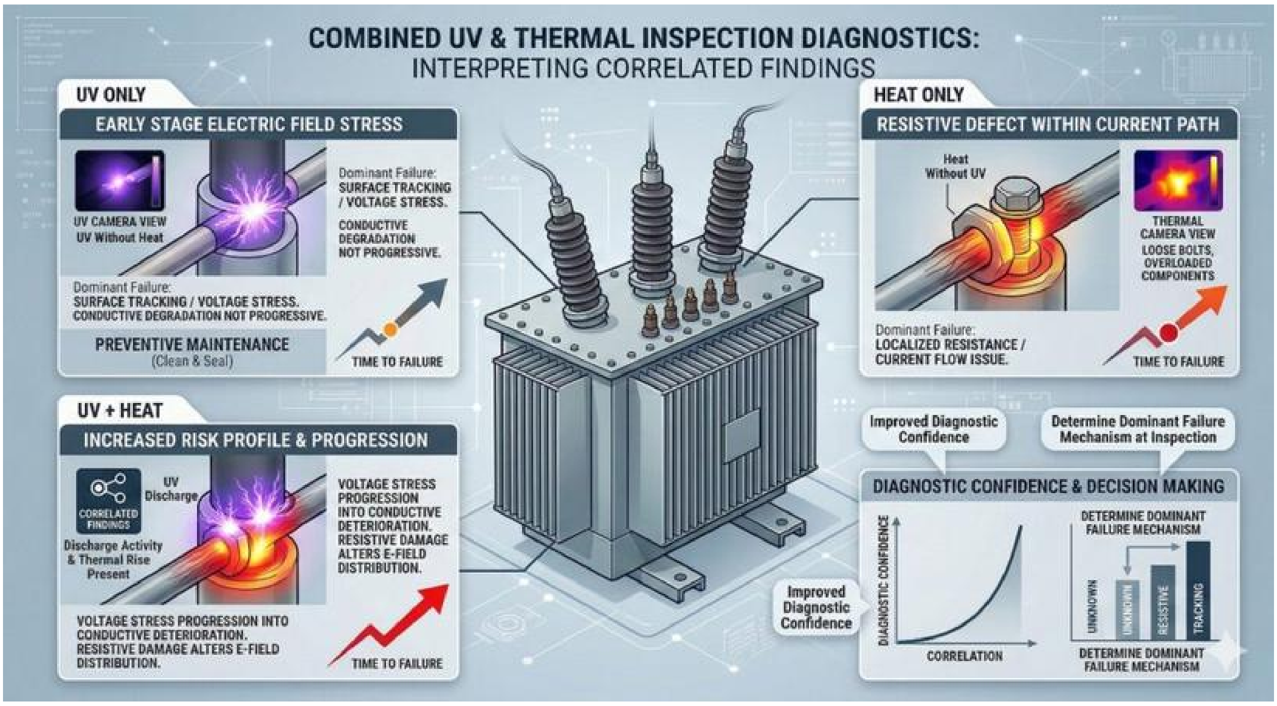


Correlation of UV and Thermal Findings

When evaluating high-voltage assets, ultraviolet and thermal findings should be interpreted together whenever possible. Each technology reflects a different physical mechanism, and correlation provides a more complete diagnostic picture.

- UV without heat typically indicates early-stage electric field stress, before conductive degradation has progressed. This stage presents an opportunity for preventive intervention.
- Heat without UV generally reflects a resistive defect within the current path, such as a loose connection or localized overload.
- Combined UV and heat at the same location indicates elevated risk. This condition suggests that voltage-driven stress has progressed into conductive deterioration, or that resistive damage has altered the local electric field distribution.

Correlating these findings improves diagnostic confidence and supports identification of the dominant failure mechanism at the time of inspection.



Multi-Spectral Inspection Approach

Effective inspection strategies integrate multiple data sources.

A structured workflow typically includes:

1. Visual (RGB) inspection to identify mechanical defects and environmental conditions
2. Ultraviolet scanning to detect discharge activity and evaluate voltage stress
3. Thermal inspection under appropriate load conditions to identify resistive heating
4. Correlation of findings to determine the dominant failure mechanism

Consistent data capture, including load, environmental conditions, and imaging parameters is essential for reliable interpretation and trending over time.

In practice, integrating multi-sensor data into structured diagnostic frameworks enables more consistent evaluation of asset condition. Platforms such as Gridnostic support this approach by correlating ultraviolet, thermal, and visual findings within a unified analysis environment, helping translate inspection data into standardized, repeatable maintenance insights.

Conclusion

Ultraviolet and thermal imaging technologies do not compete; they address different aspects of electrical behavior.

UV imaging reveals voltage-driven stress and early-stage discharge activity. Thermal imaging identifies current-driven heating and energy loss at more advanced stages.

Used together, and supported by visual inspection, they provide a more complete understanding of asset condition across the failure progression, enabling more informed maintenance decisions and improved system reliability.

Advancing multi-sensor inspection methodologies, supported by standardized data frameworks such as IEEE 1808 and aligned with EPRI practices, is becoming central to modern asset management strategies.

Read the full article

Including real-world field examples comparing UV and thermal inspection in practice.

From Field Data to Decision Intelligence
How Utilities Turn Inspection into Action

Utilities are not short on data. UAV inspections, handheld surveys, robotics, and fixed monitoring systems continuously generate large volumes of visual, UV, and thermal information.
The challenge is not collecting data, it's turning it into decisions.
Most utilities still operate in a fragmented setup: data is stored across multiple systems, teams follow different methodologies, and there is limited ability to compare results over time. While detection capabilities have improved significantly, decision-making often remains inconsistent.
The shift taking place is not driven by better sensors alone, but by how inspection data is structured, analyzed, and connected to operational workflows.

A Structured Workflow for Decision-Making

The transformation from inspection data to maintenance action follows a structured process:

Capture → Analyze → Prioritize → Act → Closing the Loop

While this workflow is conceptually simple, in practice it only delivers value when it is standardized, connected, and continuously updated.

From Technology to Decision-Making

Inspection technologies have advanced significantly, but technology alone does not drive better outcomes.
The real transformation comes from how inspection data is structured, analyzed, and connected to decisions.
By implementing a structured workflow supported by platforms like Gridnostic, utilities can move from:

- **Data collection → Decision intelligence**
- **Reactive maintenance → Condition-based strategies**
- **Fragmented insights → A unified and scalable operational approach**

This shift enables more consistent decisions, better resource allocation, and improved long-term asset reliability.

CAPTURE
STANDARDIZATION AT THE SOURCE

Modern inspections rely on multiple sensor types:
- RGB imaging for visual context and documentation.
- UV imaging for corona partial discharge detection.
- Thermal imaging for identifying heat-related degradation.

These technologies are deployed across drones, handheld systems, robotics, and fixed monitoring installations, often by different teams and under varying conditions.

Challenge
- Data cannot be consistently compared across time or inspection campaigns.
- Metadata such as asset ID, location, and operating conditions is incomplete or inconsistent.
- Data collected from different platforms lacks a unified structure.
- Valuable inspection data becomes difficult to reuse for long-term analysis.

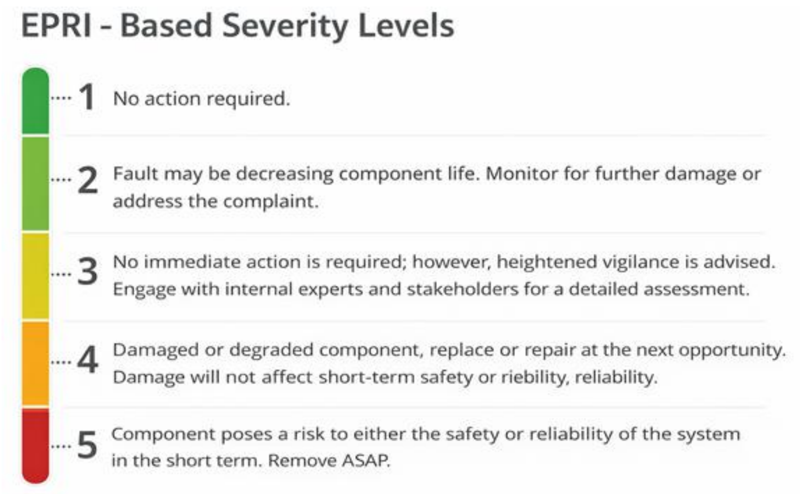
Gridnostic Solution
- Standardized data collection aligned with frameworks such as IEEE 1808, ensuring consistency in how inspection data is structured and stored.
- Unified metadata model linking every inspection to specific assets, locations, and operational context.
- Integration of data from multiple inspection platforms into a single environment.

Outcome

Inspection data becomes structured, consistent, and comparable over time, forming a reliable foundation for analysis and decision-making.

ANALYZE
FROM INTERPRETATION TO INTELLIGENCE

Once data is collected, the next challenge is interpretation.
Traditionally, inspection analysis has been performed manually, relying heavily on the experience and judgment of individual inspectors. While effective, this approach introduces variability and limits scalability.



Challenge

- Subjective evaluation of findings
- Variability between inspectors and teams.
- Difficulty maintaining consistency across large datasets.
- Time-consuming review processes for large inspection campaigns.

Gridnostic Solution

- Severity diagnostics aligned with EPRI guidelines, providing a structured and consistent approach to evaluating findings.
- Cross-sensor correlation between UV, IR, and visual imagery to provide a more. complete understanding of asset condition.
- AI-assisted detection of components and defects in visual and thermal imagery, supporting faster and more consistent analysis.
- Normalized evaluation workflows across teams and inspection types.

Outcome

Analysis moves from isolated observations to consistent, contextualized insights - from “what we see” to “what it means.”

PRIORITIZE
TURNING FINDINGS INTO DECISIONS

Inspection campaigns often generate large volumes of findings, while maintenance resources remain limited.
The challenge is not identifying issues, but determining which ones require immediate action.

Challenge

- High volume of findings with limited capacity to address them.
- Lack of a consistent framework for prioritization.
- Decisions driven by individual judgment rather than structured criteria.
- Difficulty balancing asset condition with operational risk.

Gridnostic Solution

- Severity scoring based on two key dimensions:
  1. Component condition derived from inspection data and analysis.
  2. Asset risk and impact based on criticality, environmental context, and operational importance.
- Integration of inspection results with GIS and asset data to provide full operational context.
- Structured prioritization across all findings, enabling consistent comparison

Outcome

Utilities gain clear visibility into what should be addressed first, and why, enabling a shift toward condition-based maintenance.

ACT
FROM INSIGHT TO EXECUTION

The value of inspection data is only realized when it leads to effective action.
Even when issues are identified and prioritized, translating insights into operational decisions can remain a challenge.

Challenge

- Insights remain within reports without clear linkage to execution.
- Maintenance actions are not always aligned with actual risk levels.
- Inefficient allocation of crews and resources.
- Difficulty coordinating actions across teams and regions.

Gridnostic Solution

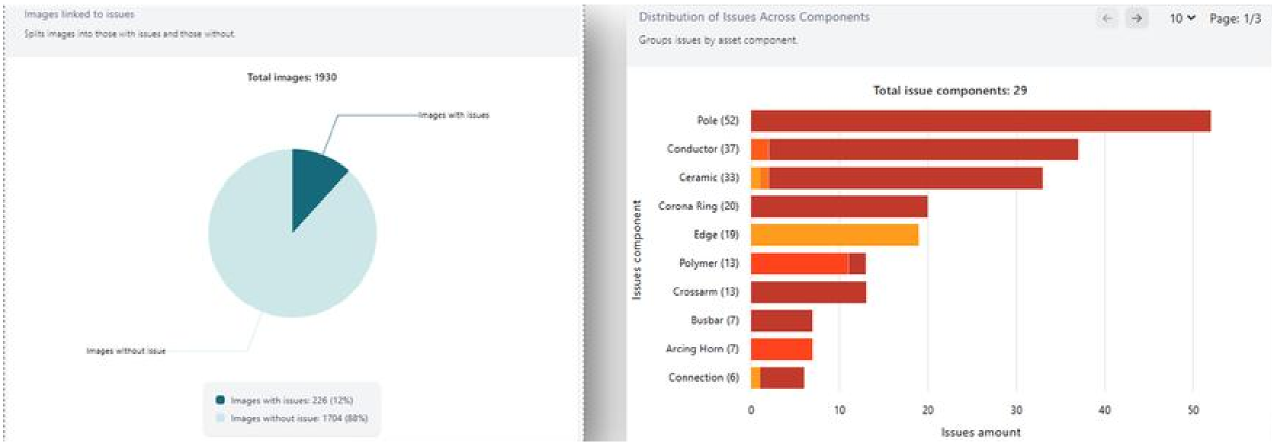
- Structured reporting that connects findings, severity, and recommended actions.
- Centralized database of historical inspection data for reference and validation.
- Risk-based prioritization integrated into operational workflows.

Outcome

Inspection results translate into targeted, efficient maintenance actions, reducing unnecessary work while addressing critical issues in a timely manner.

CLOSING THE LOOP
CONTINUOUS INTELLIGENCE

The most advanced utilities treat inspections as part of an ongoing process rather than isolated events.
They build a continuous feedback loop between inspection, analysis, and maintenance.



Challenge

- Inspection data is not fully utilized beyond initial analysis.
- Limited visibility into long-term trends and recurring issues.
- No systematic feedback between maintenance outcomes and future inspections.
- Difficulty tracking asset condition over time.

Gridnostic Solution

- Long-term asset monitoring with centralized data storage.
- Dashboards and visualization tools to track trends and performance over time.
- Continuous integration of inspection data with maintenance outcomes.

Outcome

Utilities move from one-time inspections to continuous, data-driven asset intelligence, enabling more proactive and informed decision-making.