JULY 2026

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OFIL SYSTEMS

NEWSLETTER

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Meet OFIL at CIGRE 2026 – Booth B47

Join us at the world's leading event for power system experts and discover how OFIL is empowering utilities to elevate grid reliability.
Through our advanced corona & partial discharge detection, cutting-edge multi-sensor inspection technologies, and our AI-powered asset intelligence, we deliver the clarity needed for smarter maintenance decisions.
Where to find us? Booth B47

Why Commissioning Is Becoming One of the Most Critical Phases in 765kV Projects

The global expansion of 765kV transmission infrastructure is accelerating as utilities seek new ways to move larger amounts of power across long distances, connect remote renewable resources, and support rapidly growing electricity demand.
Much of this growth is being driven by electrification, hyperscale data centers, industrial expansion, and the integration of large-scale renewable energy resources.

These ultra-high-voltage projects often represent investments of hundreds of millions or even billions of dollars. Yet despite the scale of these investments, some of the issues that ultimately affect reliability can originate from surprisingly small defects.

At 765kV, electrical stresses are so high that minor imperfections that would be insignificant on lower-voltage systems can become sources of corona and partial discharge activity. A damaged fitting, improperly installed grading ring, transportation damage, or a slight assembly deviation may create localized electric field concentrations that only become apparent once the asset is energized.
The challenge is that many of these defects cannot be identified through conventional visual inspections alone.

The Commissioning Gap

Modern 765kV projects undergo extensive engineering reviews, factory testing, quality assurance procedures, and construction inspections. However, the period between final installation and initial energization remains one of the most critical and often underestimated phases in the entire asset lifecycle.

Commissioning represents the first time that every component in the system is exposed to actual operating electrical stress.

While construction inspections can confirm that equipment has been assembled according to drawings and specifications, they cannot always verify how the installed asset will behave electrically under full operating voltage. At 765kV, the electrical field itself becomes a critical part of system performance.

Small installation deviations, improperly oriented grading rings, missing hardware, incorrect clearances, damaged components, manufacturing defects, or minor geometric variations can significantly alter local electric field distribution. These issues may pass visual inspection, dimensional verification, and mechanical acceptance testing without raising concerns.

Only when the system is energized does the electrical field fully develop, allowing hidden weaknesses to reveal themselves through corona and partial discharge activity.

In many cases, corona is not the defect itself - it is the first visible indication of an underlying problem. A component may have been installed incorrectly, damaged during transportation, manufactured outside specification, or assembled in a way that creates excessive electrical stress concentrations. These conditions often remain invisible until operating voltage is applied.

Utilities worldwide have encountered commissioning-stage issues such as reversed grading rings, missing grading rings, defective spacer batches, improperly installed hardware, incorrect conductor geometries, damaged fittings, and assembly errors that successfully passed conventional inspections but became immediately visible once the asset was energized.

For this reason, energization serves as the first full-scale electrical validation of the entire installation.

This challenge extends beyond transmission lines themselves. 765kV substations are among the most critical assets in the transmission network, concentrating massive amounts of power within a relatively compact footprint. During commissioning, components such as bushings, disconnectors, circuit breakers, busbars, connectors, and insulators are exposed to operating electrical stresses for the first time.

Detecting corona and partial discharge activity at this stage allows utilities to identify hidden installation defects, assembly errors, and manufacturing issues before the facility enters commercial service.

The financial implications are significant. Issues discovered during commissioning are typically far less expensive to correct than those identified months or years later. Once a line or substation enters commercial operation, corrective actions become more complicated, outages become more costly, and responsibility between contractors, suppliers, and asset owners may be more difficult to establish.

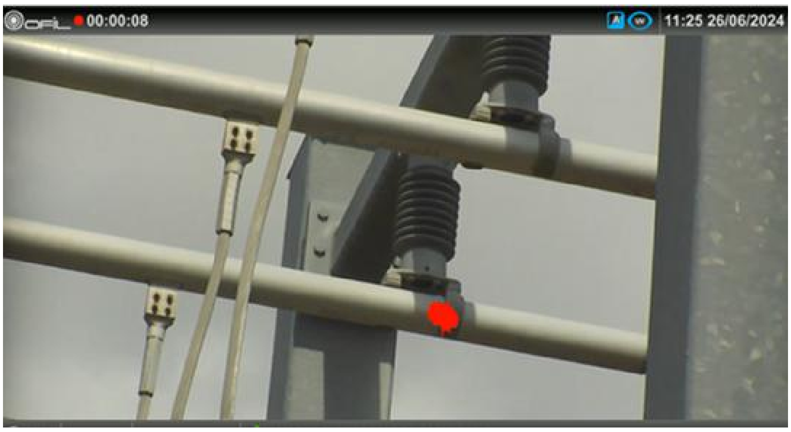
A single issue identified and corrected during commissioning may cost only a fraction of what it would cost to diagnose and remediate after the asset enters commercial service, when outages, mobilization costs, and operational constraints must also be considered.
As a result, many utilities are placing greater emphasis on technologies that can verify the electrical performance of installed assets before final project handover.

Beyond technical validation, commissioning inspections can also provide an important layer of contractor acceptance and warranty verification. Identifying abnormal corona or partial discharge activity before final handover allows utilities to address installation errors, manufacturing defects, or construction-related issues while responsibility remains clearly assigned to contractors and equipment suppliers. Detecting these problems before the asset enters commercial service can significantly reduce future disputes, simplify corrective actions, and help ensure that the infrastructure meets its intended performance and reliability requirements from day one.

In many respects, commissioning represents the last opportunity to identify and correct electrical performance issues before they become the utility's operational responsibility.

Seeing What Conventional Inspections Miss
Corona and partial discharge are often among the earliest indicators of developing electrical problems.
Unlike thermal anomalies, which typically appear after significant deterioration has already occurred, corona activity can reveal elevated electrical stress at a much earlier stage. This provides utilities with a unique opportunity to identify and address problems before they evolve into failures, outages, or accelerated asset degradation.
Solar-blind ultraviolet imaging enables inspection teams to directly visualize corona and partial discharge activity on energized transmission and substation assets during daylight operation.

This capability provides an additional layer of validation during commissioning by helping teams identify defects that may otherwise remain hidden until they develop into larger reliability concerns. Rather than relying solely on visual acceptance criteria, utilities can verify actual electrical performance under operating conditions and address abnormal discharge activity before the asset enters long-term service.



Partial Discharge due to improperly installed fitting on busbar, detected during substation inspection with UV camera.

Building a Baseline for the Future

The value of commissioning inspections extends far beyond immediate defect identification.

A comprehensive corona inspection performed during initial energization creates a documented baseline of asset condition. Future inspections can then be compared against this reference point to identify emerging deterioration, contamination effects, hardware aging, environmental influences, or changes in electrical performance over time.

As utilities continue investing in digital asset management, predictive maintenance, and condition-based monitoring strategies, this baseline becomes increasingly valuable for prioritizing maintenance activities and supporting long-term reliability planning.

Within substations, the commissioning baseline can later support fixed monitoring systems, robotic inspection programs, and AI-driven asset management platforms, enabling utilities to track changes in asset condition and detect developing problems long before they impact reliability.

Looking Beyond Construction

For utilities investing hundreds of millions of dollars in new transmission infrastructure, commissioning is increasingly viewed not simply as a project milestone, but as a critical opportunity to validate asset quality, verify contractor performance, establish future maintenance baselines, and reduce long-term operational risk.

As 765kV transmission lines and substations continue expanding worldwide, utilities are increasingly recognizing that project success is not measured solely by completing construction on time or within budget.

Long-term reliability begins at energization.

The ability to identify and correct hidden electrical defects before they become operational problems can significantly improve asset performance throughout the life of the transmission system. For ultra-high-voltage infrastructure, finding small problems before they become large ones is often one of the most cost-effective reliability investments a utility can make.

In an era of growing transmission investments, increasing power demand, and rising expectations for grid reliability, commissioning is no longer simply the final step before handover - it is increasingly becoming the first step in a long-term reliability strategy.

Introducing OFIL's Continuous Monitoring System: Integrated UV + Thermal Intelligence

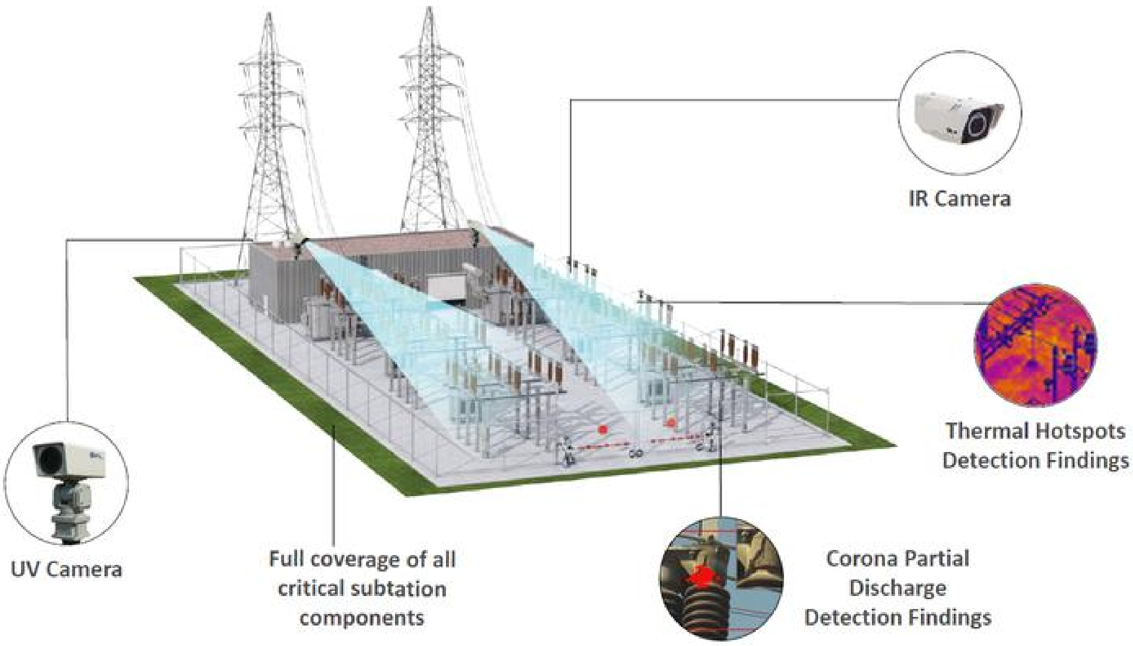
As utilities face increasing pressure to improve reliability, reduce unplanned outages, and maximize the value of existing infrastructure, the need for continuous asset monitoring has never been greater.

For years, utilities have relied on separate technologies to detect different failure mechanisms. Thermal cameras identify overheating components, while UV technology reveals corona and partial discharge activity, often long before a defect becomes visible or causes an outage.

The challenge is that many asset failures do not begin with a single symptom.

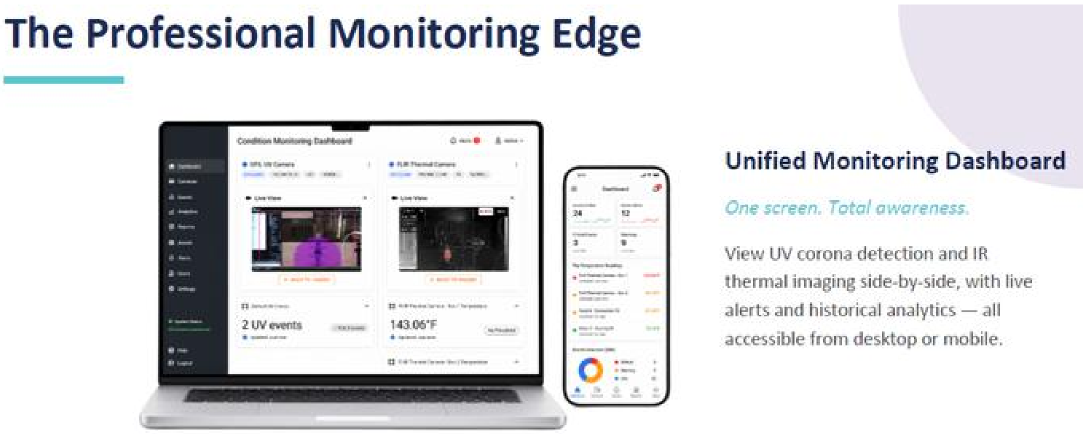
A deteriorating connector, damaged insulator, loose hardware component, or aging substation asset may exhibit both thermal and electrical indicators during different stages of degradation. When these technologies operate independently, critical information can be missed.

To address this challenge, OFIL is introducing its new Integrated UV + Thermal Monitoring System - a unified platform designed to continuously monitor both corona partial discharge activity and thermal anomalies across substations, transformers, switchgear, and transmission infrastructure.



By combining solar-blind UV sensing with thermal imaging and advanced monitoring software, the system provides utilities with a more complete understanding of asset health. Real-time monitoring, automated alarms, historical event analysis, and remote access capabilities enable maintenance teams to identify developing problems earlier and take corrective action before they impact system reliability.

The platform supports both on-premise and cloud deployments and can be integrated into existing utility monitoring environments. Flexible installation options, including fixed and pan-tilt cameras, allow utilities to tailor coverage to the unique requirements of each site.



Beyond advanced sensing capabilities, the Continuous Monitoring System provides a comprehensive software environment for monitoring, analysis, and decision-making. Utilities can oversee multiple substations and facilities from a single dashboard, visualize camera coverage on site maps and schematics, generate automated reports, configure customized alarms and alerts, and access critical asset information from both desktop and mobile devices. This centralized approach transforms monitoring data into actionable intelligence, enabling faster response times, improved operational awareness, and more effective asset management.

As utilities continue their transition toward condition-based and predictive maintenance strategies, integrated monitoring solutions are becoming an essential part of modern asset management programs.

The future of utility monitoring is no longer about collecting more data, it's about combining the right data sources to gain actionable insights, reduce risk, and make better maintenance decisions.

01
See What Others Miss
Thermal and UV work together to catch overheating and corona issues early.

02
Get Notified Instantly
Receive a phone call or text the moment something's wrong.

03
Act Before Failure
Address issues early to reduce outages and keep operations running.

Radio Frequency Interference (RFI) and Audible Noise: Hidden Consequences of Corona PD Activity

One of the lesser-discussed effects of corona partial discharge is the generation of both **Radio Frequency Interference (RFI)** and **audible noise**. While these emissions are often treated as secondary symptoms, they can become significant operational, environmental, and regulatory concerns, and in many cases are the first indication that an energized asset requires attention.

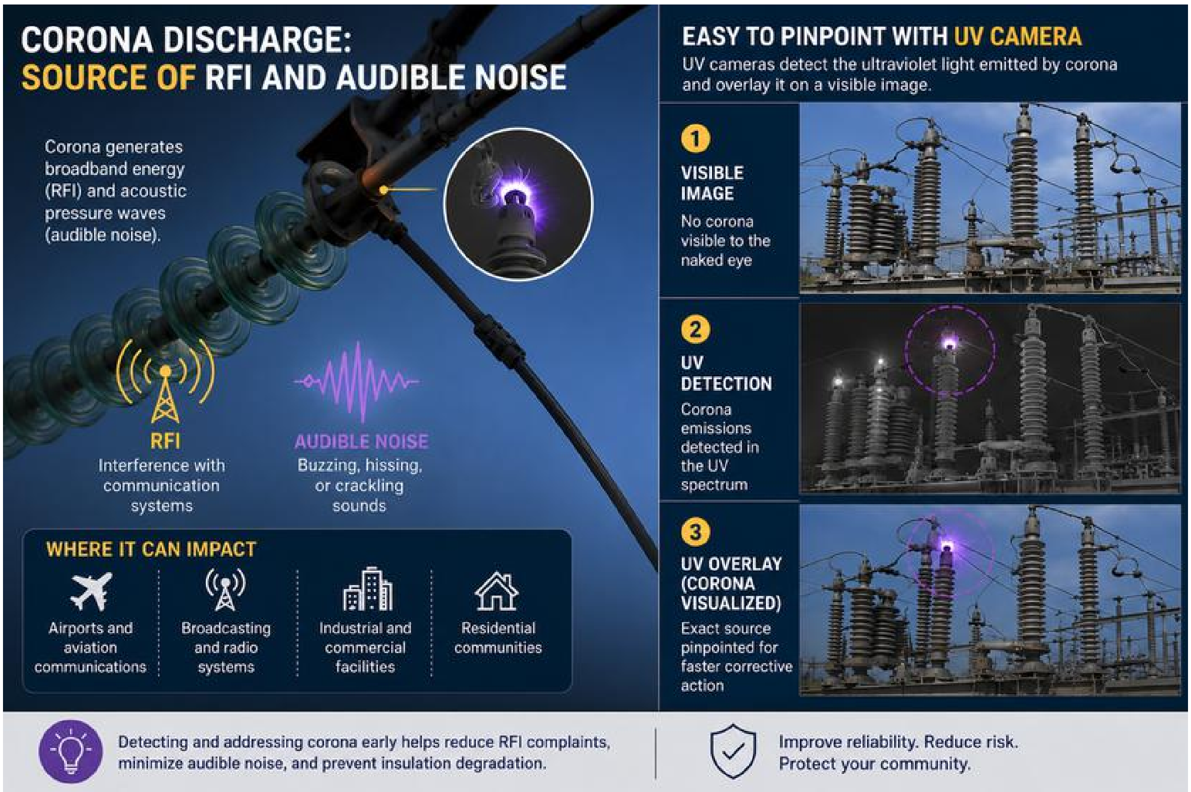
The physical mechanism is straightforward. Each corona event consists of extremely fast electrical discharge pulses that generate broadband electromagnetic energy extending into the radio frequency spectrum. These pulses radiate from the energized equipment and may interfere with nearby communication systems. At the same time, the rapid expansion of the ionized air surrounding each discharge creates pressure waves, producing the familiar buzzing, hissing, or crackling sounds associated with corona activity.

Where It Occurs

RFI and audible noise may originate from virtually any high-voltage asset experiencing corona activity, including:

- Transmission and distribution lines
- Substations
- HVDC converter stations
- Insulators, bushings, connectors, clamps, and busbars
- Switchgear and other energized equipment

The severity often increases under wet or contaminated conditions, when corona activity becomes more intense.



Why It Matters

Unlike many other partial discharge phenomena, the effects of corona extend well beyond the electrical asset itself.

For overhead transmission lines located near residential areas, audible noise can become a frequent source of customer complaints, particularly during periods of high humidity or rain. Utilities may also be required to comply with environmental noise regulations for substations located near residential or commercial developments.

Radio frequency interference presents another challenge. The broadband electromagnetic emissions generated by corona can interfere with nearby communication systems, including aviation communications, broadcasting equipment, telemetry systems, and other radio-based infrastructure. This is particularly important where substations or transmission corridors are located near airports, industrial facilities, or communication installations.

Even when the electrical equipment continues operating normally, excessive RFI may trigger investigations, regulatory requirements, or customer complaints.

Fast and Accurate Localization with UV Imaging

While RFI receivers and acoustic detectors can confirm that interference exists, identifying the exact source can be a lengthy process—especially in large substations containing thousands of energized components.

UV cameras dramatically simplify this task by directly visualizing the corona responsible for the emissions. Instead of searching for the source through signal strength or sound intensity, inspectors can immediately identify the exact insulator, connector, fitting, conductor, or hardware producing the discharge.

This allows maintenance teams to quickly distinguish between multiple potential sources, prioritize repairs, and verify corrective actions after maintenance.

As utilities continue moving toward condition-based maintenance, UV imaging provides one of the fastest and most effective methods for locating the corona sources responsible for both radio frequency interference and audible noise, helping improve reliability while reducing inspection time and unnecessary troubleshooting.

The Growing Reliability Challenge of Aging Grid Infrastructure:
Assets, Expertise, and the Future of Utility Reliability

As the power industry focuses on artificial intelligence, hyperscale data centers, renewable energy integration, and new 765kV transmission projects, a less visible challenge is becoming increasingly important: much of the world's electrical infrastructure is growing older.

Across North America, Europe, and many other regions, a significant portion of transmission and distribution assets were installed decades ago. Transformers, insulators, switchgear, substations, transmission lines, and associated equipment that were originally designed for operating lifetimes of 30 to 50 years are now being expected to support power systems facing unprecedented demands.

At the same time, utilities are being asked to do more with these existing assets than ever before.

Rising Demand, Aging Assets

Electricity demand is growing rapidly due to several converging trends:

- Electrification of transportation and industry
- Expansion of renewable energy resources
- Increased reliance on electricity for critical infrastructure
- Rapid growth of AI-driven and hyperscale data centers

While new transmission projects are being developed, most of the grid carrying these increasing loads consists of infrastructure that has been operating for decades.

Higher loading levels can accelerate aging mechanisms, increase electrical and thermal stress, and expose weaknesses that may have remained undetected for years. Components that previously operated comfortably within their design margins are now often expected to perform under significantly different operating conditions.

The reality is that the grid of the future will continue to rely heavily on assets built decades ago.

The Workforce Challenge No One Can Ignore

The aging infrastructure challenge is being compounded by another major industry trend:
the retirement of experienced utility personnel.

For decades, utilities have relied on highly skilled engineers, technicians, and inspectors who developed an exceptional ability to identify emerging problems long before they became failures. Much of this expertise was built through years of field experience rather than written procedures.

Many organizations are now facing a wave of retirements that is removing significant institutional knowledge from the workforce.

As experienced employees leave, utilities risk losing:

- Historical knowledge of asset behavior
- Understanding of recurring failure patterns
- Expertise in interpreting inspection findings
- Practical knowledge gained through decades of operational experience

This creates a difficult situation where the industry must manage increasingly complex and heavily loaded infrastructure while simultaneously dealing with a shrinking pool of experienced experts.

Why Traditional Maintenance Models Are Under Pressure

Historically, many utilities relied on time-based maintenance programs, where inspections and maintenance activities were performed according to predetermined schedules.
While this approach has served the industry well, today's operating environment requires a more dynamic strategy.
Not all assets age at the same rate. Some may continue operating reliably for decades, while others can develop defects much earlier due to loading conditions, environmental exposure, manufacturing variations, installation quality, or contamination.
As budgets, workforce resources, and outage opportunities become more constrained, utilities increasingly need to understand the actual condition of assets rather than simply their age.
This is driving the transition toward Condition-Based Maintenance (CBM) and risk-based asset management.

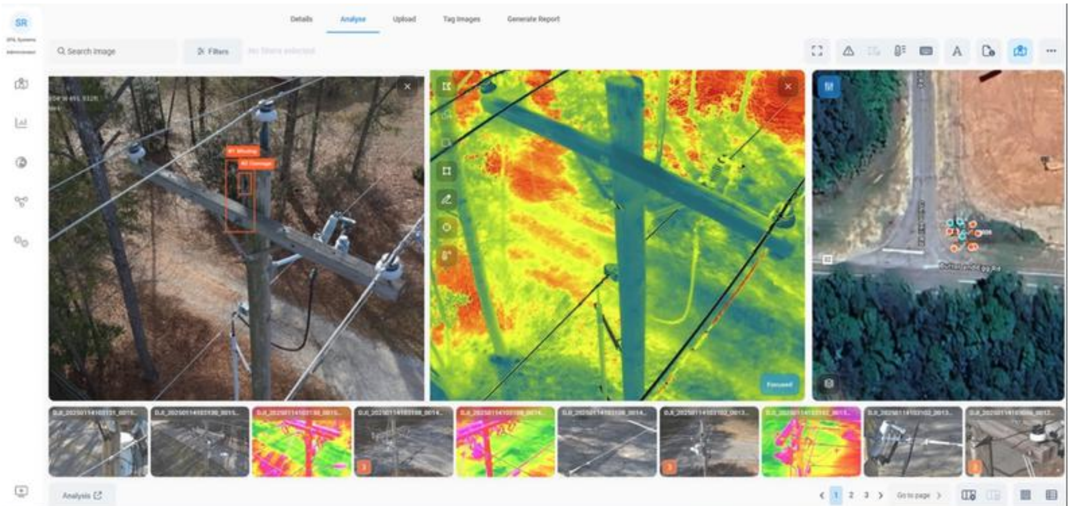
The Rise of Multi-Sensor Inspection

As utilities move toward condition-based strategies, inspection technologies are evolving as well.
No single technology can reveal every developing defect.
Different technologies provide different perspectives:

- UV imaging can identify corona and partial discharge activity.
- Thermal imaging reveals abnormal heating conditions and load-related issues.
- Visual imaging provides contextual information and documentation.

Increasingly, utilities are recognizing that combining multiple inspection technologies delivers a more complete understanding of asset condition than any single technology alone.
The ability to correlate findings across UV, thermal, and visual data sources significantly improves diagnostic confidence, reduces uncertainty, and helps prioritize maintenance actions more effectively.

Gridnostic inspection screen displaying findings from RGB and thermal imaging cameras



From Data Collection to Knowledge Preservation

The growing adoption of digital inspection technologies is creating another important benefit: preserving organizational knowledge.
Historically, inspection findings often remained within individual reports, spreadsheets, or the experience of specific personnel.

Today, digital asset management platforms can capture, organize, and standardize inspection data across entire utility networks.
When inspection results are stored consistently over time, utilities can create a permanent knowledge base that remains available even as experienced personnel retire.
This transforms asset management from being dependent on individual expertise to being supported by organizational intelligence.

From Inspection Data to Asset Intelligence
Utilities have never collected more inspection data than they do today.
The challenge is no longer gathering information.
The challenge is transforming information into actionable decisions.
Artificial intelligence and advanced analytics are increasingly helping utilities:

- Identify patterns across large inspection datasets
- Detect emerging defects earlier
- Prioritize assets based on risk
- Support less-experienced personnel with expert-level insights
- Improve consistency in asset condition assessments

Rather than replacing experienced engineers, these technologies help scale expertise across larger organizations and ensure that valuable knowledge remains available to future generations of utility professionals.

Reliability in the Next Decade
The future grid will undoubtedly include advanced technologies, AI applications, renewable generation, and expanded transmission infrastructure.
However, one reality remains unchanged: much of the electrical infrastructure supporting that future will consist of assets already in service today.
The challenge facing utilities is not simply managing aging equipment. It is managing aging equipment, increasing demand, growing system complexity, and a changing workforce - all at the same time.
Organizations that successfully combine condition-based maintenance, multi-sensor inspection, digital asset intelligence, and knowledge preservation strategies will be best positioned to maintain reliability in an increasingly demanding operating environment.
Because in the end, grid reliability is no longer determined solely by the condition of the assets, it is also determined by how effectively utilities can transform data and expertise into informed decisions.

As utilities move toward condition-based maintenance and data-driven asset management, the ability to transform inspection data into actionable intelligence is becoming increasingly important.

Watch the video

to see how Gridnostic combines inspection data, asset history, and AI-assisted analytics to support smarter maintenance decisions and improved grid reliability.

Featured Article: Drones, Remote Sensing, and the Future of Powerline Inspection

POWER SYSTEMS TECHNOLOGY

Powerline inspections are rapidly evolving. Drones equipped with RGB, thermal, and UV sensors are enabling utilities to collect richer data, improve safety, and identify emerging asset issues earlier than ever before. Combined with GIS-based asset intelligence and AI-driven analytics, these technologies are helping utilities move from reactive inspections toward predictive asset management.
In this article, we explore how multi-sensor drone inspections, geospatial intelligence, and AI are transforming utility maintenance strategies and improving grid reliability.

Read the full article →

Originally published in Power Systems Technology magazine: June 2026 issue of Grid Modernization and Flexibility magazine.

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