

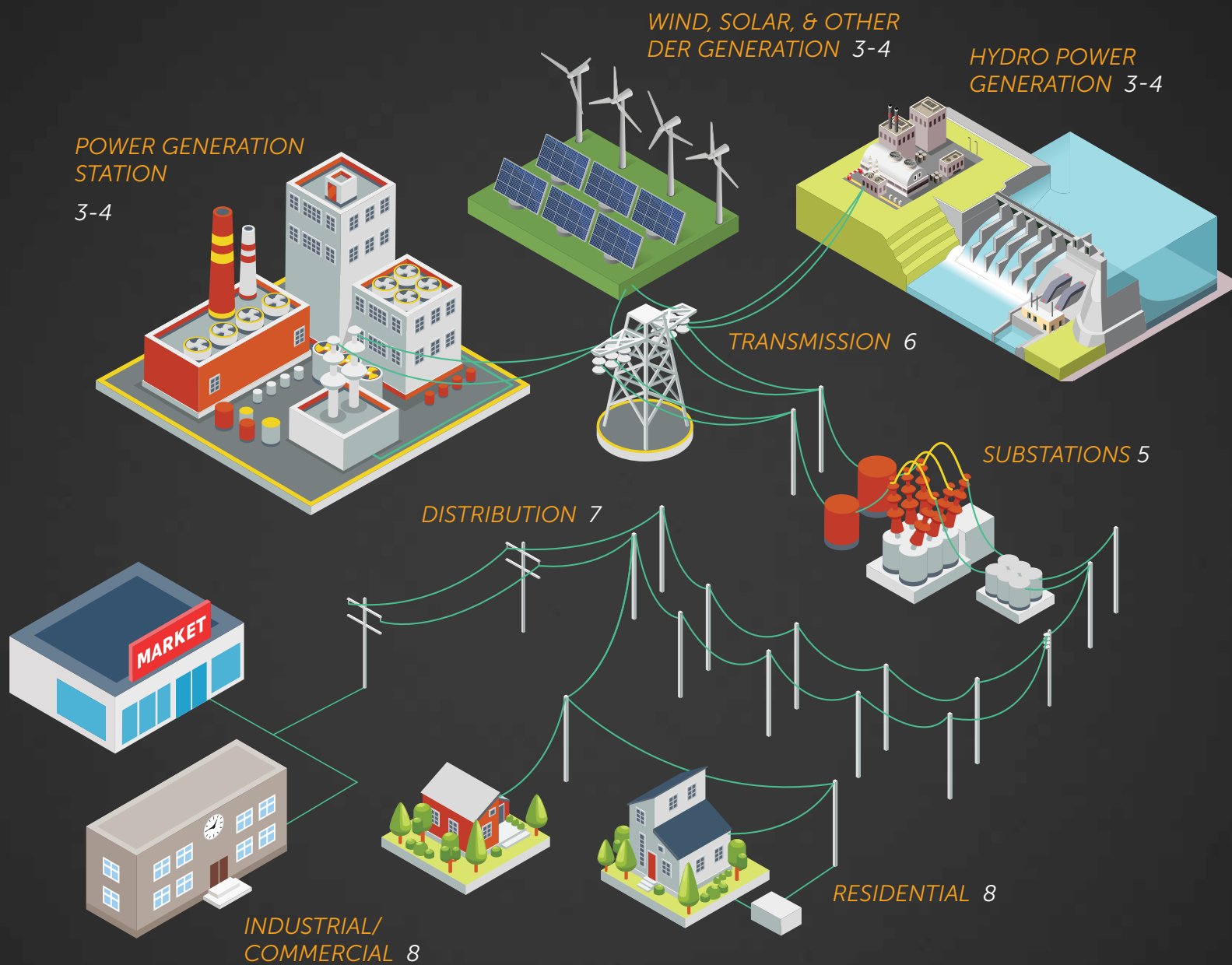
ELECTRIC UTILITY

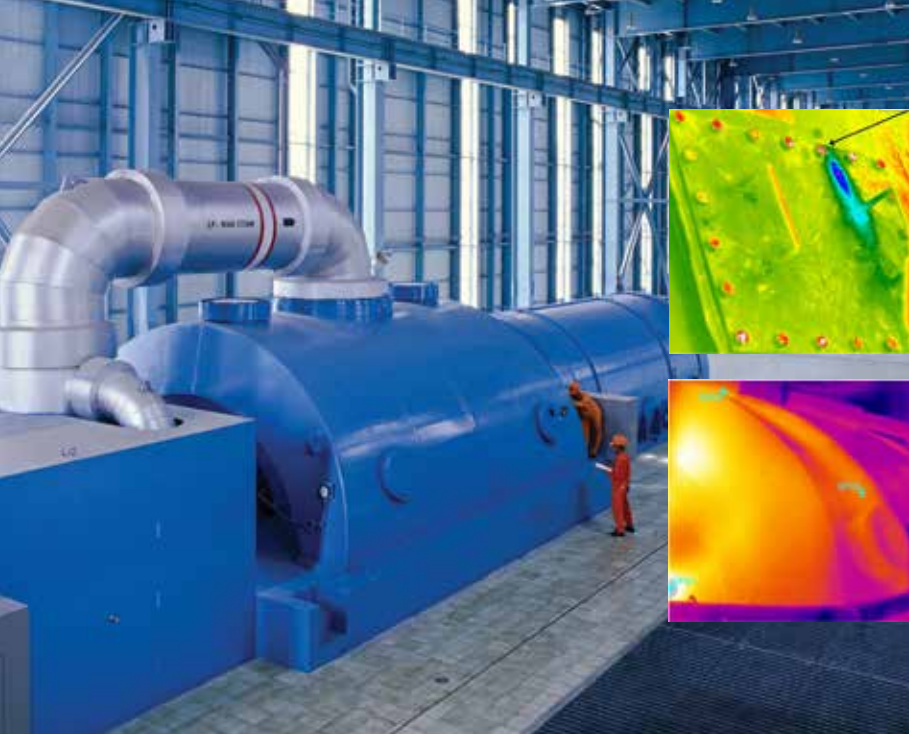
SOLUTIONS FOR POWER GENERATION,
SUBSTATION/TRANSMISSION, & DISTRIBUTION

TELEDYNE FLIR ELECTRIC UTILITY SOLUTIONS

Save time and ensure equipment reliability with powerful, high-tech tools from Teledyne FLIR. Whether it's your responsibility to maintain uptime at electric power generation stations, keep the power flowing through distribution networks, or troubleshoot failures at the residential and commercial level, Teledyne FLIR offers the Total Solution for Condition Monitoring: thermal imaging, acoustic imaging, gas detection, test equipment, analysis software, and secure storage—all with the goal of helping you diagnose potential problems before they turn into expensive failures.

TABLE OF CONTENTS

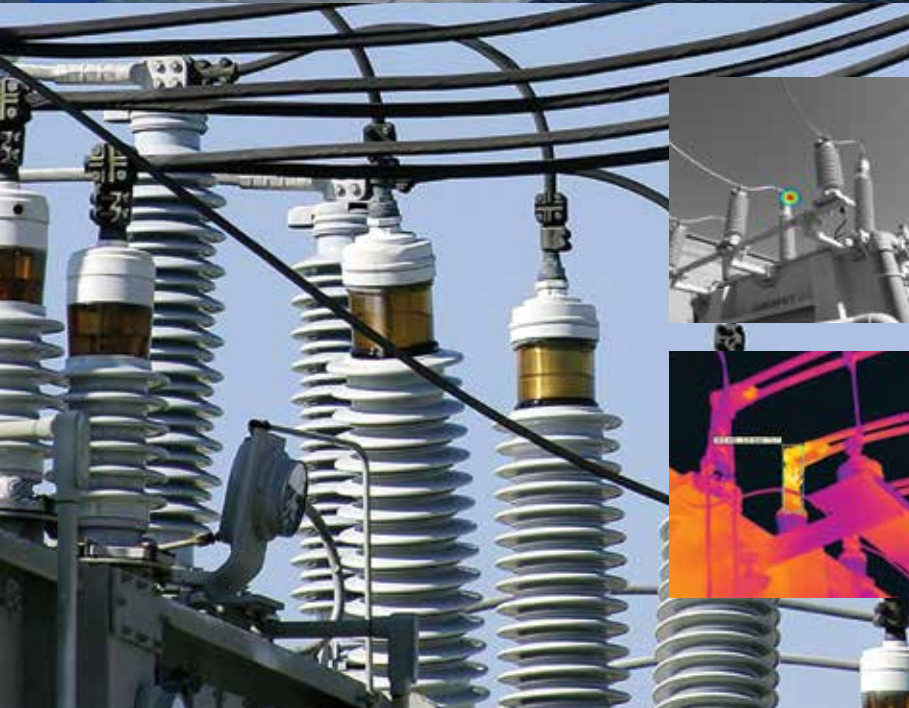




ELECTRICAL POWER GENERATION

Steam Turbine Inspections

Turbine generators are the heart of the power plant but must be maintained to avoid costly repairs and outages. Thermographic inspection technology can help detect issues early. A special camera that sees carbon dioxide (CO_2) can be used to help locate leaks in hydrogen-cooled generators by adding small quantities of CO_2 into the mix as a benign tracer gas. For generators that rely on natural gas, an uncooled optical gas imaging camera filtered for methane (CH_4) can help inspectors identify leaks throughout the system. Finally, maintenance teams can use an acoustic imager to identify high pressure leaks and a standard thermal camera to inspect electrical and mechanical components.



General Preventative Maintenance

Bushing and other electrical component failures can cost your company millions of dollars in lost revenue from downtime, repairs, and overtime pay for workers. Through regular inspections, you can detect electrical component failures before they occur. Traditional inspection methods, including Micro-ohm tests or power factor measurement, can be labor-intensive and require you to take the system out of service. Incorporating thermal and acoustic imaging technologies into your inspection routine allows you to locate sources of potential equipment failure early, saving repair costs and avoiding equipment downtime.



To learn more about FLIR Solutions for Power Generation visit www.flir.com/power-generation



Solar Inspections and Diagnostics

Routine solar panel inspections are an essential part of operational efficiency. They are critical to prevent larger breakdowns, manage warranty claims with equipment suppliers, and operate within contracted performance and yield guarantees. A UAS solution with onboard thermal imaging makes it easy to quickly inspect a large target area and pinpoint solar panel problems from the air. Once the problem is identified with infrared, a digital multimeter or clamp meter can help you diagnose electrical issues at the point of failure and determine the proper course of action. Incorporating thermal inspections into your routine maintenance plan will reduce your inspection times, help you work more safely, and improve your overall efficiency.



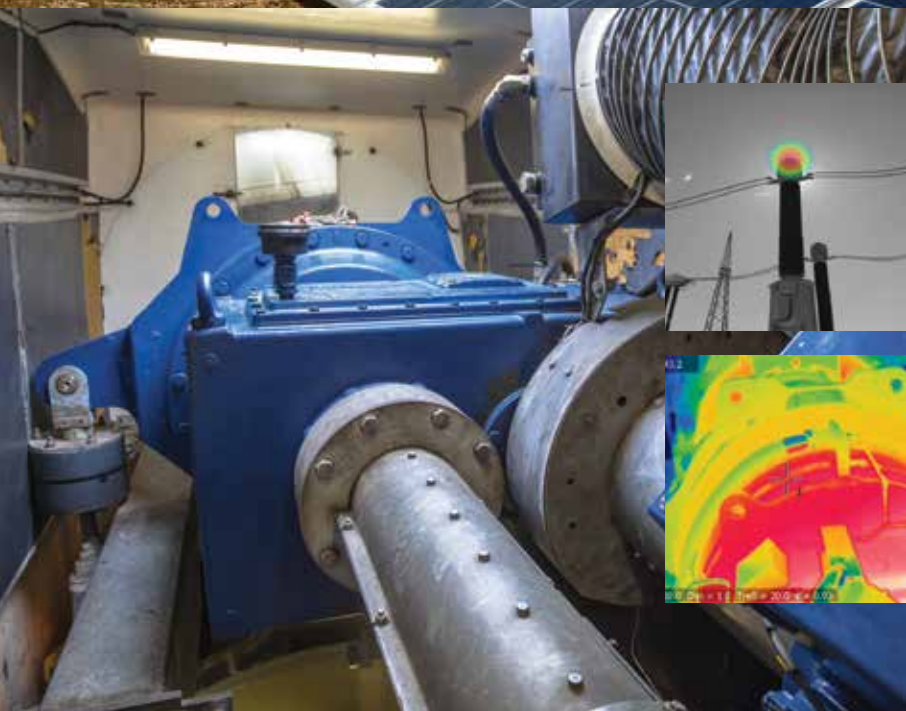
*SIRAS™ with FLIR
Vue® Pro R Payload*



FLIR E96™



FLIR CM65™



Wind Power Preventive Maintenance

Wind turbine components are susceptible to wear and can break down. When this happens, the end-result may be costly downtime or a bad accident. That's why preventive maintenance, periodic inspections, and continuous monitoring are so important. Acoustic imaging is a great technology that allows you to inspect all high- and medium-voltage components of the wind turbine and surrounding electrical systems to detect problems before breakdowns occur. Adding a fixed smart thermal imager to continuously monitor electrical and mechanical systems will help improve workplace safety, giving field technicians the ability to see problems before they turn into expensive breakdowns.



FLIR AX8™



*FLIR A50/A70™
Smart Sensor*



FLIR Si124-PD™



FLIR VS80™-IR21



ELECTRICAL SUBSTATION

Insulator Inspections and Diagnostics

When an insulator fails, it may cause a widespread outage. There's a good chance it will affect multiple components in the transmission system—creating a larger, more unmanageable problem. It isn't always easy to inspect for potential failures as insulators are often located up high and out of reach. Regular temperature monitoring using a combination of acoustic and thermal imaging cameras can help you both inspect and diagnose impending failures before they occur. With an acoustic imager, you can inspect for partial discharge. Using a thermal camera, you can easily scan for temperature differences and hot spots to locate the problem area and diagnose the issue. You'll establish a safer work environment, increase grid reliability across the system, and improve customer satisfaction by ensuring no loss of electricity.



FLIR T-Series™ with
FlexView™ Dual
FOV Lens



FLIR Si124-PD™

Continuous Temperature Monitoring

If a LTC fails, the entire transformer will shut down, costing your utility millions of dollars in added overtime pay for workers and expenses to expedite repairs. This outage will adversely affect numerous distribution circuits and the remaining power grid due to the need to reroute the load to supply the affected circuits. A fixed thermal image sensor is a valuable tool for recording or monitoring temperatures in real-time, as it can help you understand the temperature trends of an LTC and other critical components, and then make decisions on the health of the transformer before it fails. However, it can be challenging to collect sensor data from products with different communication protocols across a system. A communication hub such as FLIR Bridge solves the problem of sensor incompatibility by allowing companies to integrate different sensors without the need skilled, in-house IIoT programmers.



FLIR AX8™



FLIR A500f/A700f™



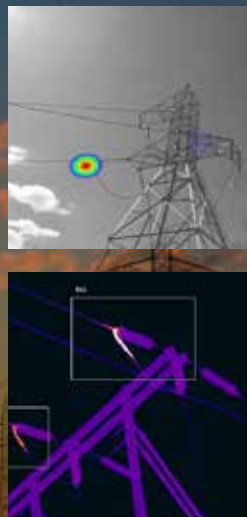
FLIR Bridge Pro™

For more information about FLIR Electric Substation/Transmission solutions, or to schedule a product demonstration please visit www.flir.com/substation-transmission

ELECTRICAL TRANSMISSION

Inspecting Connections in Electrical Transmission

Unplanned transmission line repairs can easily cost millions, so it's important to regularly inspect every connection to ensure that they are in working order. Every system has a lot of small connections, often located high up out of reach. Connections get hot before they fail. Conducting regular surveys of substations and transmission lines using both acoustic and thermal imaging devices can give you a full picture of potential problems. You can visualize partial discharge or measure the temperature of overheating connections and diagnose problems before outages occur—minimizing the cost of repairs, maximizing equipment life, and keeping the power on for customers.



FLIR Si124-PD™



SIRAS™ with FLIR
Vue® Pro R Payload



FLIR T1020™



FLIR E8-XT™

Inspection of SF₆ Circuit Breakers

When you suspect that there's a gas leak in a SF₆ breaker, it's crucial to locate and fix it immediately to minimize downtime and revenue loss. This isn't always easy to do using traditional gas-detection methods such as sniffers or soap bubbles. The longer a leak is left unrepaired, the more revenue lost, and the greater the carbon footprint on the environment. By using a portable, non-contact optical gas imaging camera you can visualize SF₆ and other gas emissions without the need to shut down operations. You can also quickly scan substations for leaks while maintaining a safe distance from high-voltage equipment. Catch leaks early, reducing revenue lost from breakdowns and repairs. Doing so will also help reduce emissions so your company can meet environmental regulations and avoid potential fines.



FLIR GF306

ELECTRICAL DISTRIBUTION

Distribution Transformer Inspections

If a transformer overheats and fails, it can be devastating to the utility. A widespread outage might disrupt power to thousands of customers, and the cost to repair or replace equipment is expensive. Regular temperature monitoring using advanced diagnostic thermal imaging cameras can help you easily inspect and monitor the temperature distribution on the outside surface of each transformer to catch impending failures before they occur. It will show you what the naked eye can't see — hot spots that indicate overheating parts — so you know where to investigate further. Find hidden signs of electrical resistance and mechanical wear so you can begin repairs immediately.



*FLIR T-Series™ with
FlexView™ Dual
FOV Lens*

Underground Electrical Vault Inspections

Catching the hot spots that indicate electrical faults is the best way to avoid outages that disrupt power to thousands of customers. But performing a thorough inspection of underground electrical distribution vaults can be problematic: they're hazardous, difficult to access, and can require special permits to open. A thermal industrial videoscope will allow you to inspect an underground vault while staying topside—and in some cases, without removing the manhole cover—all while avoiding the dangers of energized cables and water intrusion. Continuous thermal imaging with an alarm-enabled sensor is another easy way to detect potential problems in small or difficult-to-reach spaces. Both methods can work together to ensure potential faults are caught early, correctly diagnosed, and repaired before causing an outage.



FLIR VS290-32™



FLIR AX8™



*FLIR A50/A70™
Smart Sensor*

For more information about FLIR Electric Distribution solutions or to request a product demonstration please visit www.flir.com/power-distribution

COMMERCIAL & RESIDENTIAL

HV Electrical Distribution Panel Inspection

Without power, factory operations cannot continue. That's why regular scheduled maintenance is important to ensure your electrical distribution system is in working order. A thermal imager can help you detect hot spots in your distribution system before an outage occurs. Once the source of the problem is identified, a clamp meter can help you diagnose electrical issues at the point of failure and determine the proper course of action. You'll avoid downtime, unnecessary maintenance or repair costs, and lost profit.



FLIR E96™



FLIR CM94™

Commercial & Residential Electrical Panels

As an electrician or service provider, it's crucial that you find and fix electrical problems before they turn critical. You rely on pocket-portable thermal imagers and test instruments to investigate failing power inlets, transfer switches, and fuses. Inexpensive thermal imaging cameras can help you locate problems, point them out to customers, and prove they've been repaired. Clamp and digital multimeters enhanced with thermal imaging offer a two-in-one advantage by helping you find the source of a problem and collect the data you need to fix it.



FLIR DM166™



FLIR C5™



FLIR PORTABLE INFRARED AND ACOUSTIC CAMERA SOFTWARE

FLIR helps you work more efficiently and boost productivity through software suites and mobile applications for Android and iOS devices.

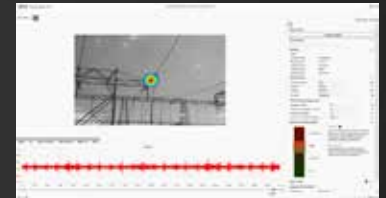
SOFTWARE AND CLOUD SOLUTIONS

FLIR Thermal Studio Pro, FLIR Ignite Cloud storage, and FLIR route management provide the total solution your team needs to streamline inspections, analysis, and reporting.

FLIR Thermal Studio Pro: Build an efficient survey roadmap with the FLIR Route Creator software plugin, then download and run it using the Inspection Route feature on your camera. Once your inspection is complete, bring the images back into FLIR Thermal Studio for processing, analysis, and reporting.

For acoustic imaging, the FLIR Si124 comes with a software plugin for FLIR Thermal Studio Pro that allows you to calculate critical decision-making data such as leak rates, costs, and level of threat from partial discharge.

FLIR Ignite: Upload images wirelessly to this cloud-based service, which automatically manages the safe and secure back-up of your data and instantly shares the content with authorized team members.



FLIR Software Development Solutions

FLIR's Software Development Kit (ATLAS SDK) allows companies to use their own Computerized Maintenance Monitoring Systems (CMMS) to support read-out of thermal measurements as well as inclusion of METERLiNK® data, GPS, compass, and other important parameters embedded within the image.



THE INFRARED TRAINING CENTER

Thermal Imaging Value

The greater your knowledge of thermal imaging, the greater the dividends you'll realize for your company and your career. That's why the Infrared Training Center (ITC) offers classes for utility industry applications—from free, online courses to advanced certification training.

ITC courses include:

- *Level I, II, and III Thermography Courses*
- *Electrical Inspection and Level I Electrical Thermography Courses*
- *Optical Gas Imaging Certification Course*

WORLD-CLASS INFRARED TRAINING

ITC thermography certification courses help prepare you to take a leadership role in an infrared inspection program. Level I certifies that you know how a thermal imager works and how to use it. Level II cranks up your credibility with more in-depth concepts and intensive labs. Level III asserts that you have the knowledge and skills to develop and administer your company's thermography program. These certifications offer strong validation to support the work you do as a thermographer.

ITC offers classes at training centers around the globe, at locations within your country, at your company's facility, and even on-line. On-site training is encouraged if your company needs to certify a group of 10 or more. ITC's on-site training courses are the best way to accommodate a large group on a limited budget. Our instructors will travel directly to your facility to limit your travel costs by keeping staff on site, reducing downtime and short staff issues.

Visit <https://flir.com/ITC-onsite-training> for more information about on-site training.

For a complete list of courses and a current schedule, visit infraredtraining.com.



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