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SPRING 2026

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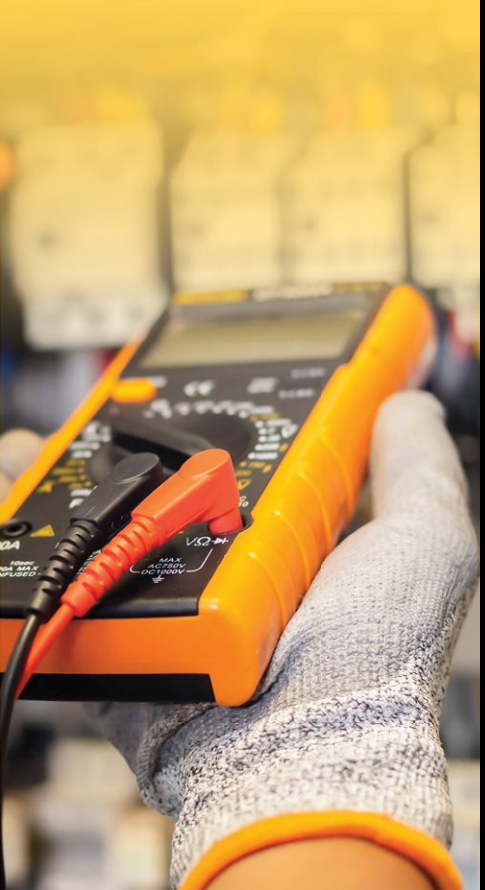

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WHEN THE FIELD GETS FAST: THE NEW SAFETY AND QUALITY REALITY

BY MORTEZA TALEBI and JASON GREER, *PowerX*

Modern power-system testing and commissioning environments are no longer static. Compressed schedules, evolving access windows, and multi-party coordination have introduced a new operational reality: Priorities shift midstream, and without deliberate control measures, safety and quality can degrade simultaneously.

THE NEW REALITY OF FIELD EXECUTION

Here's a scenario many teams recognize: A job lead steps onto a site with a plan: cables first, then breakers and relays, then a coordinated energization window. A few days later, the sequence shifts. Access windows move, another workstream advances, and the crew is asked to pivot to a different lineup "right now." A section that felt controlled yesterday may be energized today. The lead—often newer to the role—tries to stay responsive, says yes, and starts moving people around. That's no longer an occasional scenario. For many testing and commissioning teams, it's simply the operating reality of complex, multi-party project execution.

In conversations with field teams and operational leaders across the country, one theme came through clearly: Safety and quality aren't slipping because people don't care. They're being challenged by an operating reality defined by tighter timelines, shifting sequences, and heavier documentation demands—while expectations remain unchanged: Execute safely, deliver consistent results, and produce defensible records. In that setting, one pattern shows up repeatedly: When the plan changes, teams must deliberately re-establish control of the work environment and of the deliverables.

THE PRESSURE IS REAL—AND IT'S QUANTIFIABLE

Electricity remains a persistent cause of workplace death. Electrical Safety Foundation International (ESFI)'s compilation of Bureau of Labor Statistics (BLS) reports 1,940 workplace fatalities involving electricity from 2011 to 2023, and notes that about 150 workplace electrical fatalities occur on average each year.[1] NFPA's analysis of the Census of Fatal Occupational Injuries (CFOI) data indicates 142 workers died from exposure to electricity in 2023.[2]

At the same time, demand for skilled electrical labor continues to climb. BLS projects about 81,000 electrician openings per year, on average, over the decade.[3] DOE's U.S. Energy & Employment Report 2024 also highlights accelerating clean-energy employment growth, reinforcing the broader signal: Workload, complexity, and staffing pressure are rising together.[4]

Now add the cost of getting quality wrong. A landmark Construction Industry Institute (CII) study of nine industrial projects found that deviations requiring



rework, including redesign, repair, or replacement, averaged 12.4% of total installed project cost.[5] More recent CII benchmarking focused specifically on field rework shows mean values in excess of 3% of construction-phase cost for heavy industrial projects—before considering the indirect impacts that often follow.[6] Even if your organization experiences only a fraction of these levels, the takeaway holds: Quality is not paperwork—it's schedule, margin, and credibility.

WHAT WE ARE SEEING IN THE FIELD

Safety Awareness Can Drift into "Just Execute"

When the cultural message becomes "go do your job and come back," awareness narrows. People focus on completing tasks rather than maintaining control of the work environment—especially when crews are moved between locations, scopes, or equipment states. This is how near-misses are born: not from ignorance, but from stale assumptions. The crew's mental model of the job no longer matches reality.

Figure 1 illustrates how this drift can develop over time, as everyday adaptations gradually separate planned work from actual field practice, allowing risk to accumulate unless control is intentionally re-established. The concept is drawn from safety science literature, including Sidney Dekker's work on drift into failure.[7]



Figure 1: *Drift into Failure Model*

Planning and Mobilization Are Inconsistent—and the Field Feels It

Planning and mobilization can look very different from one project team to the next. In some operations, internal kickoff, scope review, specification alignment, and pre-job clarification are treated as standard practice before the crew ever rolls. In other cases, that rhythm is difficult to sustain—especially when work spans multiple sites, manpower rotates frequently, and continuity is limited because no single lead owns the job from start to finish.

The same friction points tend to follow:

- The job folder may exist, but not everyone can find critical information quickly under time pressure.
- The quoted scope doesn't always match what's physically on site, and newer job leads may not have a reliable reference for what "good" sequencing looks like—or how much time is realistically planned per piece of equipment.
- Optional work, exclusions, and special requirements can remain unclear until they surface as conflict late in the job, when the schedule is already tight.

When planning isn't consistent, the field naturally compensates. And that compensation often takes the form of field-solving—fast decisions made with incomplete context, where safety control and quality outcomes become harder to protect.

Real-Time Schedule Shifts Create a Decision-Making Gap for Newer Leads

One of the most repeated concerns was not technical capability; it was decision-making and communication when conditions change in real time. Schedule needs evolve midstream, commissioning teams adjust sequences, and energization windows shift. In those moments, the field lead must determine the safest and most efficient path forward: Continue as planned, realign sequencing, or route the change through the agreed escalation channel so priorities and impacts are clearly understood.

For newer job leads, especially, the natural instinct is to stay responsive and keep everyone moving. But when changes are absorbed informally—without a clear pause to re-establish control, secondary effects appear quickly. Efficiency drops as setups are torn down, repeated, or duplicated. Risk rises as work boundaries blur and the energy-state picture becomes harder to maintain. Documentation suffers as the day turns into firefighting. And scope creep can slip in without formal change control, creating downstream friction on schedule, cost, and deliverables.

Table 1: *Common Quality Return Reasons and Downstream Impacts*

Typical Quality Issue	Downstream Impact
Spec-driven requirement missed (test, value, or note)	QA/QC rework, client questions, potential retest, perceived gap in technical rigor
Required test not performed or not documented	Report rejection or hold, additional site visit or retest, schedule, and cost impacts
Duplicate or incorrect serial numbers, equipment IDs	Traceability problems, extra QA/QC time, and confusion for the owner and future maintenance
Inconsistent pass/fail logic or missing acceptance criteria	Loss of confidence in results, follow-up clarification calls, delayed final approval
Wrong or outdated drawing or client form used	Revision confusion, resubmittal required, perception that the team is not aligned to specs
Incomplete documentation package (missing reports, certs)	Report returned for completion, invoice delays, extra administrative and QA/QC effort
Formatting or template errors on specific forms	Correct-and-resubmit cycle, time spent on non-technical corrections, credibility drags

Quality Failures Often Result from Basic, Repeatable Mistakes

The most painful quality issues described weren't exotic engineering problems; they were avoidable breakdowns in everyday workflow. Teams are seeing reports sent back because spec-driven requirements were missed, required tests weren't performed or documented, serial numbers were duplicated, pass/fail logic wasn't applied consistently, and cable IDs didn't match drawings or field labels.

In other cases, the wrong drawings or client/vendor forms were used, or documentation packages were submitted incomplete, requiring rework to meet contract expectations. Table 1 highlights some of the most common reasons reports are returned—and the downstream impact they create for QA/QC and the client.

The deeper issue is visibility. Technicians and newer job leads often don't see what happens after a report is rejected. Leaders want crews to understand the downstream impact—how much effort QA/QC spends reconciling gaps, what questions the owner or commissioning team asks when data doesn't line up, and how quickly confidence can erode when deliverables aren't right the first time.

Closeout Is the Silent Leak in the System

Even strong execution can end poorly if closeout isn't controlled. The difference often comes down to whether the final report is truly complete, whether retests and pending work are tracked to closure, and whether the deliverable package aligns with what the contract actually requires. Just as important is taking time for a brief post-job review—capturing lessons learned while the details are still fresh—so the next crew benefits from what this crew discovered.

Without a consistent closeout mechanism, organizations end up reliving the same friction on the next job. The work may get finished, but the learning doesn't stick because the system never captures what mattered enough to improve planning, execution, and training.

THE ROOT CAUSE ISN'T MOTIVATION—IT'S OPERATING CONDITIONS

This is the key insight from the field: Today's operating environment is pushing teams toward reactive execution.

- Crews often rotate across multiple sites, projects may run for long durations without a dedicated lead maintaining continuity, and schedules are compressed with shifting access and energization windows.
- Priorities can change quickly as site needs evolve, while kickoff practices vary by region and project team, leaving some crews without the same level of alignment before work begins.
- When escalation pathways for field decisions aren't clearly defined—or aren't consistently used—job leads are left to make high-consequence calls in real time.
- At the same time, many organizations have invested heavily in technical capability, but not enough in practical decision-making training for fast-changing conditions.

These are not character flaws. They are system conditions—and system conditions require system fixes.

BEST PRACTICE: BUILDING CONTROL INTO FIELD EXECUTION

Across top-performing field operations, a clear pattern emerged: Strong performance isn't driven by one heroic job lead or one perfect crew. It comes from a repeatable operating rhythm—a control loop—that keeps scope, safety, and deliverables aligned even when the site environment changes. It starts with an internal kickoff that quickly aligns the team on scope, specifications, resourcing, risks, sequencing, and questions that must be answered before work begins. From there, a customer kickoff confirms the practical rules of the job: chain of command, energization boundaries, access constraints, reporting expectations, and who can authorize priority changes.

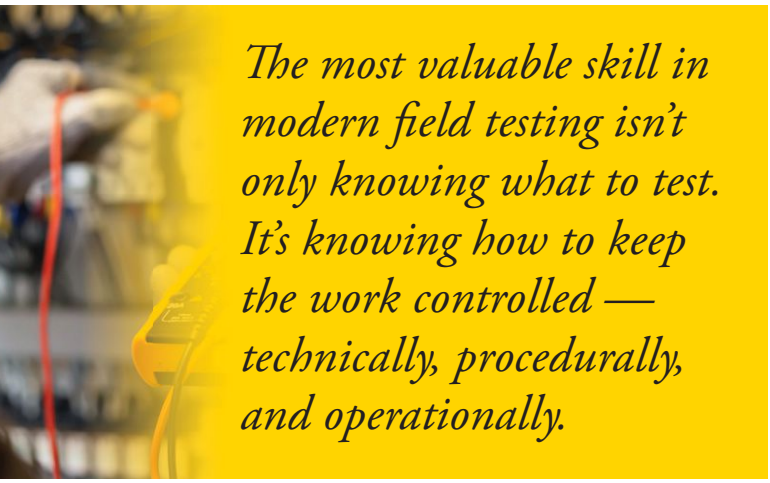
Once the job is moving, the key is discipline: Priorities do not shift midstream unless they move through the agreed channel and are documented.



Figure 2: *Field Safety and Quality Control Loop*

In parallel, QA/QC expectations are made visible to the field so technicians understand what "right-first-time" actually means, why reports come back, and how small documentation errors create big downstream delays.

Finally, teams build competence through scenario practice—realistic situations involving sequencing changes, energization timing, retest requests, and scope conflicts—so the right language and escalation steps are ready when the moment arrives.



The most valuable skill in modern field testing isn't only knowing what to test. It's knowing how to keep the work controlled — technically, procedurally, and operationally.

The loop closes with a structured closeout: final report completeness, pending work closure, and a short post-job review that captures lessons learned while they are still fresh. Figure 2 provides a visual representation of this control loop, highlighting how internal kickoff, customer alignment, change control, QA/QC visibility, scenario practice, and closeout connect to maintain control of the work and its deliverables.

This structure isn't red tape. It's the difference between work that stays controlled and work that becomes reactive. In fast-moving conditions, the organizations that consistently perform are the ones that can re-establish control of the energy state, of the plan, and of the documentation before drift sets in.

THE PRACTICAL TAKEAWAY

Safety and quality should not be treated as separate programs, because in the field they break down through the same pathways: unclear priorities, inconsistent execution routines, and loss of control when the plan changes. The strongest teams respond with an approach that feels practical and field-real—standardized kickoffs and mobilization, scenario-based preparation, visible QA expectations,

disciplined change-control channels, and professional closeout that turns each project into learning, not just completion.

Because the most valuable skill in modern field testing isn't only knowing what to test, it's knowing how to keep the work controlled—technically, procedurally, and operationally—when everything around the work is changing.

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USING CONTINUOUS THERMAL IMAGING TO DETECT FAULTS AND REDUCE RISKS

BY TROY GOSS, *SYTIS USA*

Wind turbines are a critical pillar of renewable energy production, yet workers routinely encounter significant operational risks, including overheating, electrical fires, and arc flash incidents within the nacelle, the large housing on top of the wind turbine tower, right behind the rotor blades. These issues threaten the reliability of energy output and endanger maintenance personnel, increase operational costs, and contribute to lengthy downtime.

Traditional methods of diagnosing these hazards, while long relied upon, are often dangerous, inefficient, and prone to data inaccuracies. In response to these persistent challenges, Puget Sound Energy transitioned from conventional diagnostic methods to an advanced fixed bi-spectral infrared camera solution, fundamentally transforming its approach to wind turbine maintenance.

This article explores how adopting this technology resulted in substantial improvements in technician safety, operational efficiency, real-time diagnostics, and proactive failure prevention, ultimately reshaping best practices for wind energy infrastructure maintenance.

Wind turbine maintenance has always presented challenges due to the high-risk environments where these systems operate. Identifying overheating nacelle components requires extensive manual inspections that can be time-consuming, hazardous, and error-prone. Traditional tools often fail to provide real-time insights, leading to costly downtime and safety risks to maintenance personnel. The need for more effective diagnostic methods has driven the development of continuous thermal monitoring using advanced infrared camera imaging solutions.

LIMITATIONS OF TRADITIONAL METHODS

Traditionally, diagnosing overheating and electrical component failures has required shutting down turbines, isolating electrical cabinets, and sending maintenance crews up towering structures, where they conduct inspections on cold components using tools such as multimeters.

This is time-consuming and tedious work. Single-use temperature indicators have often been left in place to find areas of excess heat. While simple, they are unreliable because they lack time stamps,



are difficult to adhere to components, and cannot provide continuous monitoring. Additionally, technicians ascend and descend multiple times to place, retrieve, and analyse these indicators, further increasing downtime and safety risks.

Maintenance personnel frequently gather incomplete or inaccurate data, leading to prolonged turbine downtime, and unplanned shutdowns caused by unexpected electrical failures place additional strain on grid reliability. The cumbersome nature of these methods also limits the ability to conduct frequent inspections, leaving potential issues unnoticed until failure. With traditional inspection methods failing to deliver actionable real-time insights, operators and maintenance personnel face ongoing uncertainty regarding the true health of their electrical systems, necessitating a more advanced solution with actionable data.

CONTINUOUS THERMAL MONITORING

Without continuous thermal monitoring of individual components, operators can react to problems only once they have already caused significant damage, rather than preventing failures before they occur. While thermocouples with remote data loggers can report that a specific component is misbehaving and ambient temperature measurement tools can report that something is amiss in a certain enclosure or area of coverage, only infrared thermal imaging can holistically see the entire space in question and send images and alarms indicating that a component has a temperature issue. If a wire

is overheating, the image will highlight the specific wire of concern along with actual temperature data.

PUGET SOUND ENERGY IMPLEMENTATION

Recognising these challenges, Puget Sound Energy adopted an innovative fixed infrared imaging approach that fundamentally improved turbine maintenance and safety protocols. Unlike previous solutions, the bi-spectral infrared camera system (Photo 1) provided simultaneous thermal and optical imaging, enabling technicians to continuously and remotely monitor critical electrical components. Real-time monitoring capability meant technicians no longer needed to power down turbines or physically access hazardous environments to assess electrical conditions.



A bispectral camera is magnetized to the panel door in the nacelle of a Vestas V80 power-factor correction cabinet at Puget Sound Energy.

This advanced technology also featured automated software-driven alerts, triggering notifications whenever components exceeded predetermined temperature thresholds. These alerts allowed immediate interventions, preventing minor issues from escalating into major failures. Unlike traditional monitoring systems that required lengthy set-up times and manual data retrieval, the fixed infrared camera powered via power-over-ethernet provided instant and ongoing visibility (Photo 2) into turbine operations. By eliminating the need for repeated physical inspections, technicians could focus on analysing and addressing performance trends over time.

Early Detection and Prevention of Failures

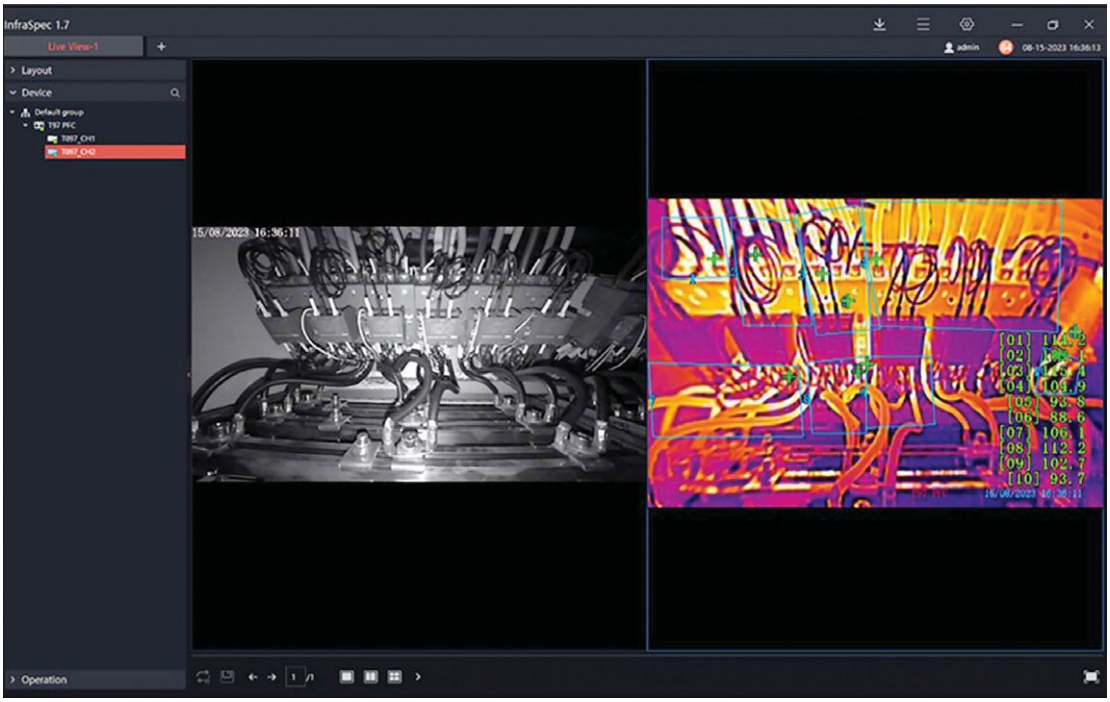
The adoption of fixed thermal imaging technology yielded immediate and measurable benefits. Puget Sound Energy discovered that wires running to suspect contactors—critical electrical components within the nacelle—were routinely operating well above their manufacturer-recommended temperature limits, in some cases exceeding 180°C (Photo 3).

The ability to identify these anomalies in real-time enabled proactive maintenance measures that significantly reduced the likelihood of catastrophic failures such as fires and electrical malfunctions. With continuous monitoring, engineers could assess historical data to determine patterns of stress on components, allowing even more targeted preventive maintenance.

Deeper Diagnostic Insights

Beyond merely identifying overheating issues, the system provided deeper diagnostic insights that allowed technicians to implement targeted corrective actions. The actionable data gave maintenance the ability to send crews up into the nacelle with a more targeted approach and with the correct replacement parts.

In one case, after optimising component spacing for improved airflow, enhancing cooling mechanisms, and adjusting system configurations to reduce heat buildup, they eliminated arc flash and fires altogether. By leveraging this data-driven

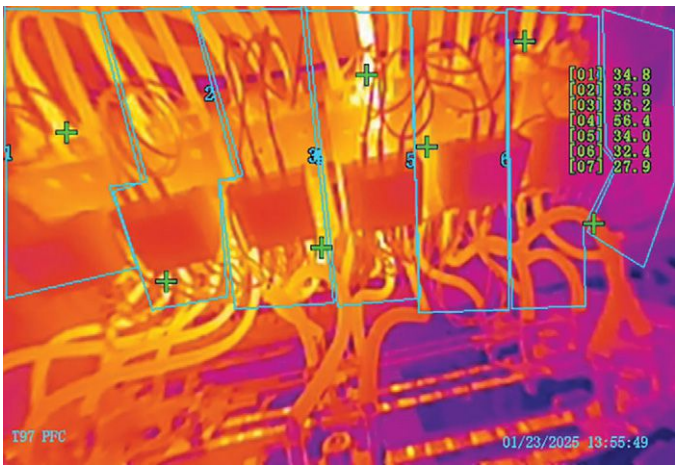


Rotated 90 degrees, this livestream screenshot shows a side-by-side comparison from the bispectral camera attached to the panel door inside a Vestas V80 power factor correction cabinet at Puget Sound Energy.

approach, Puget Sound Energy was able to mitigate operational risks, extend the lifespan of key turbine components, and enhance overall system efficiency. Moreover, the insights gained from this technology are now informing design improvements for future turbine installations, demonstrating its long-term value beyond immediate maintenance benefits.

Operational and Safety Benefits

One of the most significant advantages of implementing fixed thermal imaging was the reduction in the need for hazardous tower climbs. The real-time remote monitoring capability of the system meant that technicians no longer had to perform routine inspections of low- to high-voltage cabinets manually. As a result, technician exposure to dangerous electrical environments was substantially minimised. Puget Sound Energy estimated that the new system would reduce the number of manual cabinet inspections by at least 50%, preventing hundreds of unnecessary tower ascents annually. This reduction not only improves worker safety and uptime but also increases overall workforce efficiency, allowing personnel to focus on higher-priority maintenance tasks.



A new anomaly identified after retrofit shows a 20°C temperature differential.

Predictive Maintenance Planning

The system's continuous monitoring capabilities enabled improved predictive maintenance planning. Instead of responding reactively to failures, maintenance teams could proactively schedule interventions during planned downtime, reducing costly emergency repairs and improving overall



Fixed thermal cameras are proving invaluable for monitoring and quickly diagnosing issues within other critical systems.

wind farm efficiency. By streamlining diagnostic processes and minimizing disruptions, Puget Sound Energy achieved significant cost savings while enhancing turbine reliability. The reduction in unscheduled maintenance also translated into fewer interruptions in energy production, supporting grid stability and sustainability goals.

Expanding Applications

Encouraged by the success of fixed infrared imaging within nacelles, Puget Sound Energy began exploring broader applications for this technology across its renewable energy infrastructure. Fixed thermal cameras are proving invaluable for monitoring and quickly diagnosing issues within other critical systems, such as power converters, inverters, and switch-gear installations. As analytics driven by artificial intelligence (AI) continue to evolve, these systems are expected to provide even deeper insights into mechanical stresses, vibration patterns, and predictive maintenance trends, further enhancing operational reliability.

FUTURE POTENTIAL APPLICATIONS

The potential applications of this technology extend beyond wind energy.

- In solar farms, thermal imaging can be used to detect overheating in inverters and electrical connections, preventing potential fire hazards.
- In hydropower facilities, similar monitoring techniques can be applied to assess electrical equipment performance and identify inefficiencies.
- In battery energy storage system applications, targeted presets with alerting software will allow a specific battery to be identified and isolated prior to these temperature issues spreading heat to nearby batteries. These early-stage warnings will prevent thermal runaway long before it begins.

As renewable energy technology develops, AI-powered thermal imaging solutions are expected to improve reliability, safety, and operational efficiency. As more operators see the benefits of real-time thermal monitoring, these solutions could help improve the sustainability and resilience of energy infrastructure. ■

FURTHER READING

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This article was first published by WindTECH International.

WHERE DID THE SHOCK GO?

BY JONATHAN DYER, *ECP Solutions*

Today, we're going to talk about electrical safety. After listening to people talk at PowerTest25, I realized that NFPA 70 E and other standards always refer to arc flash and arc blast, so we'll start with that.

ARC FLASH

How many of you have taken an arc flash class? I'd hope everybody! How many have taken a shock class? Very few of you. How many of you have been shocked before? Don't lie. How many of you have experienced an arc flash? A couple of you.

I've dealt with arc flashes on the other end, so I know that when we deal with electrical safety, we forget where the shock goes. We focus much more on the flash and the blast because everybody's afraid of the after-effects. I've learned to focus on where the shock goes. There's some information on the equipment's shock label that tells you the voltage and the safe distance, but I've noticed that when people fill out their electrical safe work permits, they forget to enter the shock voltage.

Why do you think that is? It's because you're not scared of it anymore. It's just part of it. I'm going to get shocked. I'm going to go back to work. That's why I'm giving you some insights into how many shocks occur in a year and what OSHA is doing about shocks. Hopefully, you will take it back to your peers or the people that work for you or work with you.

STAYING SAFE

I got into the safety field from the medical field, where I was an EMT firefighter, and began my safety journey in the industry as a resource. That's why I usually tell people we're going to talk about habits with shock.

We're all healthy individuals. I don't eat fried foods. I don't eat pasta. You drink no caffeine, right? You have three coffees a day—four monsters a day! We're all in tip-top shape. We could run a marathon right now. But if you do get shocked, you're highly encouraged to get checked out. The main reason is that your heart is one of your body's electrical parts, and electricity is drawn to electricity. It's always going to cross your heart. It doesn't matter if I get shocked with my pointer finger and it goes down my pinky finger, it's going to cross my heart because that's the way it works. It doesn't matter if I'm grounded or not grounded.

I've dealt with shock from the front end, where people get shocked and go get seen, and I've dealt with it when people weren't so lucky. The definition of electrical shock is the perceptible and physical effect of an electrical current that enters the body. A major shock can burn internal and external tissues and cause organ damage.

When you get shocked, it leaves behind a little burn mark. What do you think it does to the inside of your body? It burns you from the inside out. I showed a little video in our NFPA class that shows a foot. For two or three days, it looks fine, but after about three weeks, they end up losing the foot. It burned all the tissue and all the muscles. It's like anything else. If you get a bruise or a lump on your arm, it normally expands. It starts to swell. The same thing goes when you get a burn on your body. As the muscle tries to heal itself, it expands and expands and swells up, and sometimes you end up losing that appendage.

Figure 1 shows the path—1,000 ohms or 120 volts. Are you always grounded? Not always, but if I'm going to touch something, your foot is most likely on the ground.

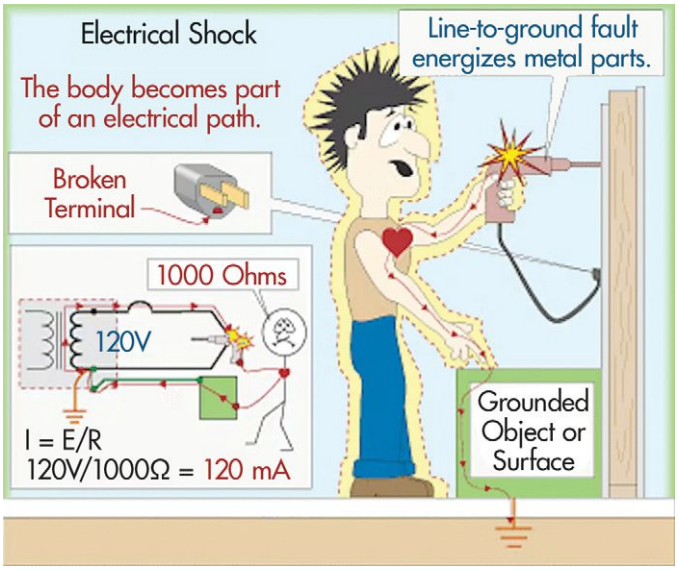

Figure 1: *The Path of an Electrical Shock*

How many of you use drills at home? Do you have that old drill with a plug without a ground? How many of us take our broken tools home—things like extension cords with the ground pulled out. The safety professional says, "Hey, you can't have those here!" But it's a new cord, so you take it home, and it happens.

What I want to show you is that it's going to go through your body, and it's going to cross your heart. So I highly recommend that if you or someone in your crew gets shocked, encourage them to go see a doctor. Get an EKG, get a sonogram, get them to do something just so you don't get a phone call the next day, and the wife says, "Hey, my husband didn't wake up. Did something happen at work?" I've had stories like that where I've had to deal with things on the back end. Somebody gets shocked, they go home, they go to sleep. They don't wake up the next day. Not all of our bodies can withstand it like we think.

20.000 15.000 10.000 4.000	**4A and over - Heart Paralysis, Serious Tissue and Organ Burning**
0.100	100 mA to 400 mA - Certain Ventricular Fibrillation
0.050	50 mA to 100 mA - Possible Ventricular Fibrillation
0.030	30 mA - Breathing Difficult, Fibrillation in small children
0.015	15 mA - Muscles "freeze" in 50% of population
0.010	10 mA - Let-Go Threshold
0.005	***5 mA - GFCI Trip Level***
0.001	1 mA - Perception Level

Figure 2: *Effects of Electric Shock as the Power Increases*

EFFECTS OF ELECTRICAL SHOCK

How many of you have been shocked on a ladder or scaffold? You deal with conductors all the time—all sorts of various kinds of body resistance. Some people have tough leather skin. Guys who work with their hands all day long don't use lotion, and they've probably built up some body resistance.

How many of you sweat profusely when you're out working in the heat? If you're in an electrical room, they turn the power off. You're working on temporary power, just enough lights, so now you're sweating. Now you've got another conductor on your body. How many of you wear arc-rated PPE every time you go to work? If you don't, shame on you. If your company is not demanding it, you need to have that discussion, because OSHA came out with new 2024 rules. Maybe that will help your company provide the PPE you need.

I'm looking at 100 megaohms. If you deal with it on a daily basis, it can cause ventricular fibrillation. Does everybody know how to use the dummy-proof shock tool? It does work, but when you have 50 milliamps or even 30 milliamps, you will have difficulty breathing and muscle freezes. Have you been bit where you can't get off of it, and somebody had to knock you off? That's not a fun feeling.

So at 5 to 6 milliamperes, the GFCI trips. I've already been shocked a couple of times, and this probably already grabbed me before the GFCI kicked in. As it goes higher and higher and higher, heart paralysis, serious tissue damage, and organ burning occur.

But what do we do with low voltages? Do we pay a lot of attention to them when they are less than 50 or 120 volts? How many times have you heard electricians say, "It's just 120, man," but 120 can hurt. We teach a lot of electricians in our classes, and they unfortunately don't realize that they should be wearing some gloves for most of the work they

are doing. As it goes up a little bit higher, you get heart paralysis—that's the one thing you don't want to have paralyzed in your body.

PERSONAL PROTECTIVE EQUIPMENT

In November 2024, OSHA came out with new regulations on PPE. How many of you have been in a substation, and there's an arc flash suit—a common suit everybody can use. Is that going to fit you properly? Do you know if it's a layered system or if it's the old one that weighs 100 pounds and makes you sweat? Today, they make them really light, but it's a layered system.

OSHA is now saying, "Hey, we've got to protect our employees with the proper PPE," instead of, "Hey, here's a suit that's an extra-large; figure it out. Here's a size-11 glove. I hope it fits." And men and women are built differently.

Most work fails the standard. It's okay to work on stuff that has electricity. There are times and places for working stuff hot. There's nothing wrong with that, but you definitely need to know what you're doing. The 50-volt rule goes into effect despite the lack of justification and lack of PPE. Anything over 50 volts rises to 4, 6, or 8 calories. If you're wearing the new flame-resistant (FR) Cat, that's 8 calories. A lot of people don't realize they're already wearing 8 cals. You need to go put your suit on, man, even if it's only 2 calories. Yeah, you have to get a face shield and gloves. It's not called a balaclava now, it's called a head protection sock or something. They changed it in the last revision of NFPA 70.

So PPE now has to fit you, and you have to make sure your employees understand the PPE is there to protect them. Did they hear, "Here's your 8-calorie PPE; here's how to take care of it and how you're supposed to wear it." I've been in the refinery and chemical business too long. That was just the thing you had to put Nomex on. Back in my day, they still dipped my clothes. You could only wash them five times, and then they had to take them back and redip them. Now, they are way more sophisticated.

How many times do you show up, and your best technician or your mechanical guy has a ripped shirt or pants? They say, "I don't need anything new. I've been wearing this stuff for five years!" It's probably not the proper stuff to be wearing. This is something to keep in mind because OSHA does now have a special emphasis on this.

If you do have some type of electrical incident, they are going to dig into your company's PPE policy. They're going to cite you because you're probably not following what they say you need to follow. I worked for a huge electrical testing company for a long time, and up until six or seven years ago, we didn't require FR shirts and FR pants on every job, depending on what you were doing. Now it's become more of a standard, but I know we have guys who still wear cotton t-shirts in the substation because they get hot. You definitely need to make sure they're protected with FR- and AR- rated clothing.



An arc flash is a catastrophic event.

The guidance makes it clear that low voltage, including 50 volts, can sustain an arc flash and produce molten metal. They de-energize using safe work permits, using a safe work policy, and lockout/tagout. If you have read OSHA's lockout/tagout program, it keeps getting bigger, so keep in mind is that OSHA is getting into this. They did make a change: DC 48 volts is now 50 volts.

You can't roll it down. You have to roll it up. That was in one of the NFPA updates. OSHA says whatever NFPA 70 E says, so that's what we're going to go

by. If OSHA ever comes into your office and starts reciting 70E to you, the law says they can do that. I highly encourage you to go through an NFPA 70E update class every three years. It will definitely help you out.

INJURY STATISTICS

Let's talk about some of the injury statistics that occur with shock. Electricians are part of this, and unfortunately, electrical field service falls under electricians.

Does it make sense to you that you fall under electrical? They've bundled electricians and electrical field service all together. So let's change our perspective. There are 3,500 arc flash events every year. Not all of them are reported. When I was with one of the larger companies, we probably only dealt with two or three a year, but that just means it happens way more.

Between 2011 and 2022, there were 1,322 workplace fatalities involving electricity, and 70% of the deaths occurred in non-electricity-related occupations. It means people who shouldn't be dealing with electricity: plant operators, maintenance guys, people who have not had some type of electrical training, or those who watched those old 1980 movies you still have to pop in the VCR. It's something to keep in mind because you guys are doing a great job of letting your employees know about electrical hazards, but it seems like we need to get the various aspects of electrical hazards out to the different genres. Maybe more people should be thinking about electrical fatalities.

Thirty percent of worker fatalities occurred in electrical occupations; 70% don't. There is a 1.5% average decrease in workplace electrical fatalities year over year, so we're trending in the right direction. We're just not there. We still have people who don't go home every day with all the safety training we do. How many people love safety training? We all love to sit in front of a computer for eight hours a day or do the site orientation. The only thing that changes is how fast you can go, what PPE you need to wear, and what the hazards are. But we're hiring new people into the organization who are not from an electrical background.

KEEPING YOUR PEOPLE SAFE

How many of you have over a hundred people in your organization? Could you imagine losing 109 electrical testing technicians in a year? We already know they are few and far between now. So if we keep losing 110 workers a year, we're eventually going to run out. That number stood out to me. I might have run into one of those 109 people; it makes me realize we deal with real hazards every day.

Do you put your electrical crews through the same training as everybody else? I would hope so! But some electrical companies don't put them through any training. Well, how did you get to your electrical apprentice license? Aren't you supposed to do so many safety hours a year to keep that going? Sometimes we have to re-up that with those employees, as well as painters, construction and maintenance, roofers, and truck drivers.

Why would a truck driver get shocked? How many times do they run into electrical poles? It's an easy way for DOT to say it wasn't an on-the-road fatality. Everybody wants to keep their fatalities down, but people run into poles and hit substations all the time.

What PPE can you wear that'll protect you from shock? Gloves, right? Nothing else on my body is going to protect me from shock. The number-one place you get shocked is your hands. How many of your employees are out there wearing gloves that are two years old and have never been tested?

I always look at everybody's gloves when I'm out there, simply because people forget about them. Lately, I've seen employees go into the restricted boundary, and they're just wearing arc flash-rated gloves. They put their 40-cal suit on, and then they put those 40-cal gloves on, but they don't put the rubber gloves on. I'd be more worried about a shock when I'm trying to rack a breaker rack in or out because they are typically all indoors or protected. You can protect yourself with some type of chicken-switch device or remote racking device. Let's make sure everybody's got the right PPE because with hands, the only thing that protects you is rubber gloves.

What are your options for the new protectors? Chemical rubber gloves over the electrical gloves?

Those cut-level gloves with neoprene are already hard enough to get on your hand without putting them over another pair. How do you get it long enough to protect the longer Category 2, 3, and 4 rubber gloves? Obviously, the farther up the protector goes, the more it's going to protect you.

EXTRA-HIGH VOLTAGE

Has anybody seen the new voltage chart? Has anybody dealt with ultra-high voltage yet? Has anybody been out to Phoenix, where they're running these huge solar farms and all these new highlines that are 525 kV HVDC? How do you protect your employees from that?

Is there any PPE to protect them from that? Not right now. That's a question I get asked all the time. "Hey, I'm going to have an employee go up there." No, you're not, because even the bucket trucks aren't rated for that. I asked them the other day, "Hey, can a bucket truck even get up there with it?" "No." So now we're running power that we can't even protect our employees from, and the highline crews can't even protect themselves.

Back in the day, we had to carry huge OSHA books. Now you just ask Siri, "What does OSHA say on this?" Most of you have an electrical safety program, and I hope your electrical safety program is separate from your safety program. According to OSHA and NFPA 70E, it can't be one program. You have to have separate safety programs for electricity, safe work plans, or standing work orders (SWPs). NETA puts out a lot of standards to help out with SWPs. NFPA 70E goes into more of the standards.

I recently asked AI to write a safety manual. It gives you all sorts of weird stuff. McDonald's sells 5.6 billion burgers a year, and they'll put that in your plan. If you do anything with AI, please read it before you send it out. NFPA 70B's maintenance section includes a lot more on shock. IEEE also has many books.

I think we take shock for granted. We focus so much on arc flash and arc blast. A lot of things out there can shock us. Does anybody drive a Tesla or an electric car? Did you read the manual about the electrical shock hazards and how to plug it in, and ground it, and unplug it, and ground it? If you buy an EV car, you have to watch a video on how to plug your car in.

OSHA talks about having the proper PPE in arc flash hazard rooms. You must have some type of hot stick or safety hook with safety-rated gear for any work you do that has a shock hazard. You also need a rescue plan. OSHA can cite you for that.

CONCLUSION

Remember, we all work to provide for our families and hobbies, and everyone wants to go home. I like to say, "Be safety conscious all the time."

This article is a transcript of Dyer's PowerTest 2025 presentation titled "Electrical Safety: Where Did the Shock Go?"



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OSHA'S ARC FLASH GUIDANCE: WHAT IT MEANS FOR THE NETA COMMUNITY

BY COREY HANNAHS, *National Fire Protection Association*

Safety remains a critical consideration for those working in the field of electrical testing and maintenance. For members of the InterNational Electrical Testing Association (NETA), whose work often focuses on electrical systems analysis, commissioning, and maintenance, each task is governed by the highest standards of technical accuracy and safety.

However, despite rigorous attention to protocols, the industry continues to be exposed to significant risks associated with arc flash. In the fall of 2024, the Occupational Safety and Health Administration (OSHA) released new guidance focusing on arc flash hazards that has the potential to significantly impact safety across the electrical industry, including the work performed by NETA professionals.

While OSHA's guidance does not currently establish any new mandatory regulations, it signals a growing emphasis on addressing worker exposure to arc flash risks. For NETA members, this guidance underscores the importance of aligning testing and maintenance practices around worker safety by incorporating critical safety standards, such as NFPA 70E®, *Standard for Electrical Safety in the Workplace®*, and NFPA 70B®, *Standard for Electrical Equipment Maintenance®*.

NETA professionals occupy a unique role in the electrical industry, tasked with independently verifying equipment performance and ensuring compliance with electrical safety standards. By understanding how OSHA's guidance applies to mitigating arc flash risks, NETA members can deepen their role in promoting safer work environments for their clients as well as for themselves.

UNDERSTANDING ARC FLASH RISKS IN THE CONTEXT OF NETA'S WORK

An arc flash, which occurs when electricity discharges through the air, creating temperatures hotter than the sun's surface, represents one of the most severe hazards in the electrical industry. While electric shock is more common, the risk associated with exposure to an arc flash event presents a significantly lower likelihood of survival for the worker.

NETA's members regularly interact with energized electrical systems during testing, troubleshooting, and certification of electrical equipment, in turn exposing them to potential arc flash hazards. OSHA's guidance emphasizes the critical importance of safety measures such as conducting proper risk assessments and, when required, utilizing proper personal protective equipment (PPE), both in accordance with NFPA 70E safe work practices.



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These same principles apply to NETA professionals whose line of work requires constant awareness of these hazards.

KEY TAKEAWAYS FROM OSHA'S ARC FLASH GUIDANCE

OSHA's guidance on arc flash primarily aims to address widespread safety gaps and educate both employers and employees on recognizing these hazards and mitigating the associated risk. While this information from OSHA states that it does not create new legal requirements, it does provide recommendations that look to align with existing standards such as NFPA 70E. Think of it this way: OSHA outlines what employers *must do* to keep their employees safe, while NFPA 70E provides guidance on *how to* accomplish it.

Central to OSHA's efforts in their guidance is the debunking of two myths in the electrical industry.

MYTH 1: Your Work Is Not Energized

Many workers incorrectly assume that lockout/tagout (LOTO) automatically establishes equipment as being de-energized and therefore eliminates the need for arc flash PPE. However, OSHA emphasizes that until the absence of voltage has been confirmed, equipment should be treated as energized. Testing for the absence of voltage is a critical step in establishing an electrically safe work condition (ESWC), as outlined by NFPA 70E. Due to the exposure to energized equipment, until the absence of voltage has been confirmed, appropriate arc-rated PPE (AR PPE) must be worn.

This stage represents one of the most vulnerable points for workers performing testing and maintenance; therefore, it introduces a considerable amount of risk. For NETA members conducting absence of voltage verification, OSHA's guidance reinforces the necessity of treating this step with the highest level of caution and ensuring proper arc-rated (AR) PPE is donned during testing.

It is also worth noting the difference between AR PPE and flame-resistant PPE (FR PPE) to assist in proper selection, as they do not provide the same level of protection in the event of an arc flash

incident. FR PPE is designed to resist ignition and self-extinguish when exposed to flames, offering protection against general fire-related hazards, but is not specifically tested for arc flash hazards. AR PPE, however, is tested and rated to protect against the intense thermal energy of an arc flash, making it a more specialized form of protection that meets both flame-resistant and arc flash requirements. In short, AR clothing is FR, but not all FR clothing is AR.

MYTH 2: My Work Is Justified, So It's Electrically Safe

OSHA reiterates to employers and workers that energized work should never be justified out of convenience or cost-saving measures, such as preventing downtime during business operations. NFPA 70E specifies that energized work is only permissible in exceptional cases, such as when de-energizing equipment is infeasible due to design or operational requirements (e.g., troubleshooting live systems) or when removing power introduces a greater hazard (e.g., disabling safety-critical ventilation).

OSHA's emphasis on this point is particularly relevant to NETA professionals, who may work in facilities where clients push for minimal disruptions to their normal processes. NETA-certified employers and their workers must be diligent in aligning their work practices with NFPA 70E and OSHA guidance and advising their clients on the importance of worker safety over business operations convenience.

THE POTENTIAL ROLE OF OSHA'S GENERAL DUTY CLAUSE

OSHA's arc flash guidance references the General Duty Clause found within Section 5(a)(1) of the Occupational Safety and Health (OSH) Act of 1970. This clause requires employers to:

…furnish to each of his employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his employees.

In evaluating the arc flash guidance as it could be interpreted within the General Duty Clause, the information provided by OSHA seems to establish arc flash risk as being a recognizable hazard to employers. While OSHA's arc flash guidance states that it does not establish new mandatory regulations for employers, the combination of the responsibility of meeting the General Duty Clause and the recognition of arc flash risks as a known workplace hazard would seem to place responsibility on employers to adapt their work practices to better align with this guidance. This includes aligning with safety standards, such as NFPA 70E and NFPA 70B, to help ensure workplace safety and compliance. Failure to do so could result in OSHA citations or even more severe consequences, such as additional litigation, if an incident occurs that leads to workplace injury or death.

HOW CAN NETA MEMBERS UTILIZE OSHA'S ARC FLASH GUIDANCE?

While each company needs to take in all of the information provided and determine its next steps based on its specific business model, here are some actionable steps NETA members can consider to better align their business practices with OSHA's recommendations.

Perform Thorough Arc Flash Risk Assessments

NETA professionals should routinely conduct arc flash risk assessments for each specific work task where there is known exposure to energized electrical equipment. Properly calculating incident energy and arc flash boundaries, while utilizing that information to determine the appropriate level of PPE, when necessary, sets the foundation for safe interaction with electrical systems and equipment. It is important to keep in mind that, although arc flash risk has been the discussion point thus far, NFPA 70E also requires electric shock risk assessments to take place along with arc flash risk assessments.

Ensure Workers Have Access to Proper PPE

Having properly rated PPE on hand and accessible is an important first step for NETA companies to ensure that workers utilize it. Arc flash PPE should be arc-rated, not solely flame-resistant (FR), and should be rated for the level of incident energy that is available at the particular piece of electrical equipment being serviced. This may mean that workers need access to different rating levels of PPE

while on the job. Workers should also be trained to properly determine when PPE is needed and at what rating level, as well as how to don, inspect, store, clean, and utilize the PPE that has been provided.

Reinforce Proper Absence-of-Voltage Verification

Employers should ensure that workers are properly trained on how to test for the absence of voltage as a critical step in establishing an electrically safe work condition (ESWC), in accordance with NFPA 70E. It is essential to reinforce that simply turning off a circuit breaker or disconnect switch and applying a lockout/tagout (LOTO) procedure does not guarantee that equipment has been deenergized. Until the absence of voltage is verified as part of establishing an ESWC, workers must assume the equipment is still energized and wear the appropriate level of personal protective equipment (PPE).

Educate Clients on Justified Energized Work

By educating customers on the risks of energized work, NETA professionals can facilitate more effective conversations with clients who request energized work to be performed out of convenience to their business operational needs. Clients should understand that workplace injuries not only increase risks for the contractors that they hire but also pose significant risks to their own business. Additionally, an injury could lead to other challenges, such as production downtime, long lead times for replacement parts, and the potential for being named as a defendant in any litigation related to the injury.

CONCLUSION

NETA professionals hold a significant responsibility in the electrical industry, balancing technical expertise with safety leadership. OSHA's guidance highlights how crucial arc flash prevention measures are to ensuring workplace safety. Aligning testing and maintenance practices with these recommendations is not just about compliance; it's about fostering a culture of safety across the many touchpoints of the electrical industry that so many NETA members have.

By embracing OSHA's guidance and relevant standards like NFPA 70E and NFPA 70B, NETA members can protect their own business interests and serve as a trusted resource for their clients in mitigating risk for all parties involved. Through a relentless focus on safety and effective communication, NETA professionals can reinforce their role in shaping an industry that prioritizes worker safety as much as it values performance and reliability.

Important Notice: *Any opinion expressed in this column is the personal opinion of the author and does not necessarily represent the official position of NFPA or its Technical Committees. In addition, this piece is neither intended, nor should it be relied upon, to provide professional consultation or services.*



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BRINGING NORTH AMERICA AND THE EU TOGETHER FOR ELECTRICAL SAFETY

BY MIKE DOHERTY, *Blue Arc Electrical Safety Technologies Inc.*

On October 23–24, 2025, more than 250 electrical safety, maintenance, and engineering professionals gathered in Kraków, Poland, for the inaugural Electrical Safety Conference Europe (ESC EU 2025). As keynote speaker, standing on that stage in front of so many specialists, the dominant feeling was that electrical safety in Europe and North America had entered a new phase: sharing, comparing, and integrating our cultures of safety managed systems, risk management, technology, best practices, and human factors.

WHY ESC EU 2025 MATTERED

The conference brought together people responsible for power generation, transmission, and distribution, industrial plants, commercial and public infrastructure, and data centers, all united by one concern: preventing electrical incidents and injuries in increasingly complex electrical systems.

Over two days, the ESC EU 2025 combined technical lectures, real-world case studies, and a high-end electrical safety trade show to explore how arc-flash, shock, electromagnetic fields, and emerging battery hazards can be controlled in practice, not just on paper.



Event Organizer Marcin Ruta

SETTING THE STAGE

ESC EU 2025 took place at the Premier Kraków Hotel, a venue offering modern conference facilities and ample space for the exhibition area, where world-class electrical safety experts, manufacturers, integrators, and service providers demonstrated the latest protective devices and software tools.

The event was exceptionally well organized by electrical engineer Marcin Ruta, owner of MR Power



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Systems, and his outstanding team. It was positioned as a worldwide English-language forum dedicated exclusively to electrical safety best practices.

The audience represented a broad cross-section of roles: electrical engineers and designers, maintenance leaders and supervisors, health and safety managers, contractors, and specialists from utilities and industrial sites. That diversity shaped the discussions; every topic had to span theory and field reality, from standards and calculations down to how procedures and PPE are used at 2:00 AM during a fault call-out.

Other countries represented at ESC EU 2025 were Canada (me), Sweden, Slovenia, Poland, the UK, Austria, Ireland, Germany, and the USA.

ELECTRICAL SAFETY IS A JOURNEY, NOT A CHECKBOX

The official ESC EU 2025 description highlighted "case studies, practical answers, working solutions" and positioned the event as a "premier gathering for over 250 professionals dedicated to electrical safety focused primarily on Europe." This was not a generic power engineering conference with one safety track; it was built around electrical safety as the main subject, with four strongly featured themes:

- **Electrical safety.** Practical measures, protective devices, and implementation of European and global regulations and standards.
- **Electrical hazards.** Arc flash, electric shock, electromagnetic fields, and battery-related risks.
- **Technical innovations.** Software tools, protection and control equipment, and personal protective equipment (PPE) aimed at risk reduction and controls.
- **Electrical health and safety management.** Training, procedures, safety plans, human performance, and comprehensive learning from incidents.

GLOBAL THREADS

As the keynote speaker, the task was to help the audience connect these global threads into a coherent picture: electrical safety as a foundational lifecycle, not a loose collection of devices, checklists,

and posters on the wall, focused only on basic standards-based compliance.

Human Performance

A central message of the keynote was the concept of human performance (HU) in electrical safety and its practical, pragmatic application in everyday job safety planning.

- Using CSA Z462-24 and NFPA 70E-24 effectively within the framework of a recognized health and safety management system, and how they interact with European best practices in electrical safety.
- Shock and arc flash risk assessment procedures as best practices to be noted.
- Studies by high-risk industries indicate that error precursors are very often the root cause of serious incidents.
- CSA Z462 Annex U *Human Performance and Workplace Electrical Safety* (Annex Q in NFPA 70E).

Arc-Flash Mitigation

One of the strongest technical threads across ESC EU 2025 was arc-flash mitigation from both design and operational perspectives. The conference emphasized that, while arc-flash calculations and labels are now familiar in many facilities, there is still significant unrealized potential in:

- Arc-flash detection and ultra-fast tripping or arc-quenching solutions
- Optimized relay settings, zone-selective interlocking, and differential protection, especially on low-voltage and medium-voltage systems feeding critical loads
- Rethinking single-line diagrams and equipment layouts to limit fault energy and exposure duration by design

Mikko Manninen from Finland, representing Arcteq, for example, highlighted its arc-flash product range and promoted a case study titled "Minimizing Arc Flash Incident Energy with Arc Quenching" as part of his participation at ESC EU 2025. This underlined a key point: The industry increasingly sees arc-flash mitigation as a design criterion in its own right, not an afterthought following a label update.

From a keynote perspective, these concepts were framed around risk assessment and the hierarchy of risk controls: PPE is vital, but engineering controls—fast detection, current limitation, system configuration—should be pushed as high as possible on the priority list. Critically, all those things must also be developed and fully aligned within a comprehensive safety management system.

The very best information on safety-managed systems can be found in the newly released and highly recommended book by H. Landis Floyd, *"Hidden Risk in Occupational Electrical Safety: Through the Lens of System Safety,"* which was highlighted during the keynote.

That approach aligns with European regulatory expectations that employers eliminate or reduce risks at the source wherever reasonably practicable.

Beyond Arc Flash: The Broad Spectrum of Electrical Hazards

While arc flash often captures significant attention, ESC EU 2025 deliberately broadened the conversation to encompass the full spectrum of electrical hazards. The event description explicitly listed electric shock, electromagnetic fields, electrostatics, electrical fires, and battery hazards, in addition to arc flash. This reflected real-world changes: more energy storage, more power electronics, and more sensitive electronic systems in critical facilities.

Technical Innovation: Hardware, Software, and Data

Exhibitors used ESC EU 2025 to highlight how newer protection, monitoring, and software tools can make safety decisions more data-driven. Two clear trends emerged: smart protection and control devices. Manufacturers such as Stucke GROUP highlighted digital control and protection equipment for power plants and distribution networks, emphasizing reliability and functional safety, as well as sustainability, long life cycles, and support. These devices form the backbone of selective, fast-fault-clearing, and coordinated protection schemes.

Many participants discussed arc-flash studies, short-circuit analyses, and coordination studies, using specialized software to optimize settings

and configurations rather than relying on default manufacturer parameters. The message was that software is no longer just a calculation tool; it is a platform for design and operational decisions.

My keynote positioned these innovations as enablers, not replacements, for expert judgment. Data quality, model assumptions, and configuration management remain just as critical as the sophistication of the tools.

Health and Safety Culture and Human Factors

A standout feature of ESC EU 2025 was its explicit focus on electrical health and safety culture: training, procedures, and safety plans. The event information stressed that electrical safety cannot rest solely on equipment—people, competencies, and organizational learning play a decisive role.

ESC EU 2025 marketed itself as built on case studies, practical answers, and working solutions, from the keynote perspective, encouraging participants to think of each project or incident as a learning opportunity to be captured and shared, not buried in local memory.

The key is to show how theory, standards, and technology were translated into step-by-step changes in field practice, and what measurable impact they had on risk levels or incident statistics.

The Role of Sustainability and Lifecycle Thinking

Stucke GROUP stressed sustainability and lifecycle aspects such as CO_2-neutral manufacturing, long product life, and global service and spare-parts support. At first glance, this may seem distant from electrical safety. Still, lifecycle thinking is increasingly relevant: Long-lived, well-supported devices reduce the temptation to make do with obsolete protective gear, unsupported firmware, or improvised repairs.

NETWORKING AND CROSS-INDUSTRY LEARNING

One of the explicit promises of ESC EU 2025 was networking: creating opportunities for people to connect and share ideas on how to prevent electrical incidents and injuries in the workplace. Coffee breaks and exhibition hours were deliberately given weight in the schedule, and post-event comments from MR Power Systems' Marcin Ruta underscored the extent of informal discussion around real problems and solutions.

From the keynote vantage point, those conversations are often where theory becomes actionable. A utility engineer explaining how they manage switching procedures on a live distribution network; an industrial maintenance manager sharing how they justified investment in arc-flash mitigation to top management; a data-center operator discussing how safety and uptime requirements are balanced—these insights are hard to capture in formal papers but invaluable for practitioners.

A standout feature of ESC EU 2025 was its explicit focus on electrical health and safety culture: training, procedures, and safety plans.



ESC EU 2025 AS PART OF A LONGER JOURNEY

In reflections after the conference, the organizers described ESC EU 2025 as "a journey" and hinted that the content generated would be used and shared for months and years afterward. This language matches a core theme of the keynote: Electrical safety is not solved by a single project, training session, or piece of equipment. It is a continuous improvement process within learning organizations that is shaped by:

- Evolving standards and regulations at European and national levels, and indeed within the global electrical safety village
- Technological advances in protection, monitoring, and switching
- The changing nature of electrical installations, from renewables and storage to highly digitized production lines and data centers

ESC EU 2025 showed that, across Europe, there is a critical mass of outstanding professionals who recognize this and are willing to engage beyond their own sites and sectors.

PRACTICAL TAKEAWAYS FOR READERS

For a maintenance-focused magazine audience, it is important to end with concrete steps readers can take, inspired by the Kraków, Poland, discussions. Drawing on the themes of ESC EU 2025, you can propose, for example:

- **Review arc-flash studies and protection settings.** Ensure that settings, coordination, and device capabilities are actively used to reduce incident energy where feasible, not just documented.
- **Evaluate opportunities for engineering controls.** Consider arc-flash detection, fast tripping or quenching, remote switching, and design changes that eliminate the need for energized work in front of open gear.
- **Integrate your shock and arc flash risk assessments.** Look at electrical safety holistically across shock, arc-flash, EMF, and fire; avoid separate, uncoordinated assessments that compete for resources.
- **Upgrade training with realistic scenarios.** Move beyond slide decks to practical and pragmatic exercises and simulations that reflect the actual constraints of your facilities.
- **Capture and share case studies.** Treat every project and every near-miss as a source of structured learning opportunity that can be shared within your company and, where appropriate, with the broader global community.

Vitally, all of these best practices must be incorporated into a comprehensive safety management system as the foundational step to ensure safety and operational excellence.

By framing these points as lessons from ESC EU 2025, the article can serve as both a report on the conference and a roadmap for readers who could not attend this time. ■



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FROM LUCK TO LEADERSHIP: WHY ZERO INCIDENTS MAY BE THE GREATEST RISK

BY PAUL DECKER, *Guidant Power*

As CEO of a global metallurgical equipment supplier, I watched a surveillance video in horror as our young engineer approached an electric furnace in a critical failure mode, instead of running away. It was painfully clear that we had not adequately trained him to safely perform his job. In a stroke of extraordinary fortune, he escaped unharmed from what would typically have been a fatal explosion. Until then, we had been more lucky than safe. That day, our company was even luckier.

That began my safety journey.

Over the following years, I have observed that companies across various industries, sizes, and numbers of employees are often unknowingly exposed to serious electrical hazards.

We founded Guidant Power in 2024 to help companies—mostly outside of electrical services—recognize the strategic importance of electrical safety and reliability without living through the consequences themselves, enabling them to lead with foresight instead of regret.

This article introduces *RULuckyOrSafe.com*, a free website that creates a short, customized video to encourage stronger conversations with senior leaders about electrical risks.



THE ESW COMMITMENT

The idea was born at the 2025 IEEE Electrical Safety Workshop, the leading annual conference focused on advancing electrical safety culture, technology, and practices. It is attended by professionals who share a passion for electrical safety, including technicians, engineers, senior executives, and regulators. In speaking with attendees, I recognized that many of the smaller and mid-size companies, where I had spent my career, rarely have access to this level of expertise, and for these safety experts to make an impact, their senior executives must understand the strategic importance of electrical safety and adequately prioritize and resource it.

Later in the session, Lanny Floyd, one of the industry's leading voices on electrical safety, asked participants to make a commitment for the coming year. I made two:

- Help educate senior leaders who fund and staff safety programs about electrical risks.
- Find ways to extend electrical safety expertise into smaller, privately held enterprises that often lack internal electrical experts.

WHY THIS MATTERS

Electrical testing and maintenance company leaders understand electrical risk. The challenge is largely outside our community, particularly in small and midsize commercial and industrial companies. This gap creates both responsibility and opportunity. Testing companies are often the most trusted electrical experts for their clients. When you identify deferred maintenance or equipment operating beyond its limits, you are protecting workers and operations. These conversations frequently lead to upgrades and maintenance programs that improve safety and uptime. Expanding electrical safety knowledge is central to all our businesses.

WHY ELECTRICAL RISK IS HARD TO SEE, EVEN IN WELL-RUN ORGANIZATIONS

Most company leaders care deeply about safety and want to do the right thing. Yet, even in well-run organizations, systemic factors make it difficult for untrained executives to perceive and respond to serious electrical risks. This is not a failure of leadership or intent.

Electrical accidents happen rarely, even when real exposure exists. Using our model, a 250-person firm has a 95% chance of going 13 years without experiencing an accident. When humans go for years without experiencing an incident, it feels like safety, even though it is statistically normal. Our brains have evolved to discount rare risks.

Most company incentives and KPIs reinforce this problem. They focus on what happens often, such as production interruptions, downtime, injuries, and cost, while electrical risk rarely appears in a way that attracts this type of attention. At the same time, clear ownership and visibility are often lacking because responsibility for electrical risk is frequently shared between safety, engineering, and maintenance.

Finally, when risky work produces no immediate harm, organizations may normalize the behavior, mistaking silence for safety. The Challenger disaster illustrates this effect. These forces are common across organizations. They are predictable features of human nature and how organizations respond to low-frequency, high-consequence hazards. Recognizing these blind spots is the first step toward addressing them.

WHY THE PEOPLE WHO SEE THE RISK OFTEN STAY SILENT

In small and mid-size organizations, the people best positioned to recognize electrical risk are the supervisors, engineers, maintenance leaders, safety professionals, and contractors who work closely with the equipment. Although these advocates may understand the risks, many hesitate to speak up. This is not because they do not care. It is because speaking up carries real human and organizational costs.

Many potential advocates worry about knowledge gaps and credibility. Electrical risk can be complex, and executive conversations require framing uncertainty and consequences in business terms. Even confident technical professionals may hesitate when asked to persuade rather than explain.

This dynamic creates a dangerous gap: Leaders do not see the risk, and advocates hesitate to speak up. Everyone is acting rationally, yet the organization drifts closer to harm.



Figure 1: *Screenshots from the Luck to Leadership video available on* ruluckyorsafe.com *show personalization and dramatization of a fictional accident.*

The tool described here was created to support these potential internal advocates by giving them an easier, more confident way to begin conversations with senior leaders about electrical safety.

A PRACTICAL WAY TO HELP LEADERS SEE ELECTRICAL RISK CLEARLY

To cut through the psychological and organizational barriers, the Guidant team built a personalized video tool at *RULuckyOrSafe.com* that is now offered free to all users. The *RULuckyOrSafe.com* resource is built around three questions executives naturally ask:

- Are we safe or just lucky?
- What will happen to the business if we have a serious electrical incident?
- What will an incident mean for my people, my customers, and me?

These questions are answered by three underlying models: the Luck Model, the Consequence Model, and the Impact Model. Together, they give leaders a grounded view of electrical risk.

THE LUCK MODEL: WHY ZERO IS NOT PROOF OF SAFETY

The first model uses national injury and fatality data to show how long organizations can go without serious electrical incidents. Electrical injuries are rare events. A facility can maintain a spotless record for a decade or more and still be operating with major exposures.

In the personalized video, this argument is presented in simple terms using the organization's own size and industry. Seeing their own data reframed through probability helps leaders shift from "We are fine" to "We may have been lucky so far."



Figure 2: *This graph describes how luck explains long periods without serious electrical incidents. A 500-person location has a 90% chance to go 13 years without a serious electrical incident.*

THE CONSEQUENCE MODEL: WHY ONE EVENT CHANGES EVERYTHING

The second model shows how a single electrical incident can erase years of progress, disrupt the business, and impact executive careers. It walks leaders through the realistic consequences:

- Human toll on workers and families
- Damage to equipment and long lead-time repairs
- Operational downtime and impact on customers and revenue
- Regulatory and legal exposure
- Damaged reputation
- Derailment of strategic plans

When leaders see the full risk in the context of their own company, we can expect that electrical safety becomes more of a strategic initiative than a delegated compliance task.



Every strong safety culture starts with leadership, and leadership starts with understanding.

THE IMPACT MODEL: WHY STORY DRIVES ACTION

The third model recognizes that information alone is not enough. Leaders act when risk becomes personally relevant. Research shows that narrative-based messages—those that connect risk to real people, real events, and real consequences—are more effective in motivating change.

In the personalized video, risk is made real through a short, dramatized scenario partly personalized with the company's information. It shows what a serious event would look like with people in roles like theirs. It does not exaggerate and keeps consequences realistic enough that leaders feel a responsibility to act.

The goal is not fear. It is understanding and clarity.

HOW THIS HELPS ADVOCATES

Advocates need simple, factual tools that are easy to share.

- **Reframes the conversation toward understanding.** Many leaders assume electrical safety is handled by someone else. The *RULuckyOrSafe.com* tool shows why low incident rates are not proof of safety, reducing defensiveness and opening the door to meaningful discussion.
- **Explains risk in business terms.** Executives respond to operational, financial, and strategic impacts. The video ties electrical safety to those priorities in clear language.
- **Lowers the barrier for advocates.** Advocates do not have to memorize data or become experts at safety and reliability. The video does the heavy lifting. They just need to guide the conversation.

HOW COMPANIES CAN USE THE TOOL

For electrical testing and maintenance companies, *RULuckyOrSafe.com* provides a practical way to support difficult conversations. Many companies identify reliability and safety concerns during testing, inspections, or maintenance work, but may struggle to help client leadership understand the broader risk behind their findings or to give their recommendations appropriate priority.

The tool allows service providers and internal advocates to generate a short, customized video based on basic information about the client's company. The video can be shared before or during a meeting to explain, in neutral terms, why long periods without incidents do not necessarily indicate low risk, and why electrical safety deserves leadership attention.

Strengthening Safety Culture

Every strong safety culture starts with leadership, and leadership starts with understanding. When executives understand the risk, they can begin to view electrical safety as a strategic imperative, with increased awareness and communication by senior executives, better aligning training and preventive maintenance budgets with the actual risk.

The tool does not replace an electrical safety program or important core elements like arc flash studies, breaker

testing, or electrical preventive maintenance programs. It supports the people who already understand electrical safety and need help communicating its importance to leaders in the organization.

It is important to be clear about intent. We do not know how widely this video or website will be used. That uncertainty is not the point. What matters is the commitment to help non-electrical executives better understand electrical risk and to extend stronger safety practices to a wider corporate population.

The lasting value of this effort is not a website or a video. It is the use of three well-supported models—probability, consequence, and impact—to structure conversations that are often avoided or poorly framed. These models are grounded in research and real-world experience, and they apply whether the conversation happens through a video, a meeting, or a discussion in the field.

For companies that want to improve electrical safety and reliability, this is a practical starting point. Educating leaders, spreading electrical safety thinking into a wider universe of organizations, and creating shared understanding before an incident occurs are worthwhile goals.

Try It Yourself

If you want to see how the tool can support your conversations, internally or with clients, visit *RULuckyOrSafe.com*, enter a few basic details, and watch your personalized video.

Then decide where it fits best. Perhaps a one-on-one with your CEO, your company's leadership meeting, or planning a client's work.

If it sparks even one honest conversation, it has already served its purpose.



PAUL DECKER *is the CEO of Guidant Power, an electrical safety, reliability, and training partner to North America's leading companies. He brings over 25 years of leadership experience in industrial technology companies. He was previously the CEO of ABP Induction, a metallurgical equipment company acquired by Mitsubishi Heavy Industries. Paul holds a BSE in mechanical engineering from the University of Michigan and an MS in management from Kellogg Graduate School of Management. In his free time, he enjoys cycling, swimming, sailing, and spending quality time with friends and family.*

CONTINUOUS THERMAL MONITORING: A NEW LAYER OF ELECTRICAL SAFETY WITH THE SYTIS TC-90™

Electrical safety has always been about foresight with a goal of anticipating failures before they escalate into outages, arc flash events, or catastrophic fires. In recent years, the industry has made significant progress through improved standards, training, and testing methodologies. Yet one challenge remains persistent: Most electrical assets are still evaluated intermittently, leaving long gaps where developing faults can go undetected.

Thermal imaging has long been a trusted diagnostic tool in electrical maintenance programs. Periodic infrared inspections help identify loose connections, overloads, imbalances, and component degradation. However, these inspections are snapshots in time. Conditions inside electrical panels and cabinets can change rapidly due to load variation, environmental factors, or component aging. A system that appears healthy during a scheduled inspection may develop a dangerous condition weeks, or even hours, later.

This is where continuous thermal monitoring introduces a meaningful shift in electrical safety strategy.



TC-90™ Bi-spectral Card

The SYTIS TC-90™ Bi-spectral Card Camera is a compact, fixed-mount thermal and optical camera designed specifically for installation inside electrical panels and cabinets. It adds a continuous layer of situational awareness, providing real-time thermal visibility of mission-critical assets 24/7.

From a safety perspective, the most immediate benefit is risk reduction. Opening energized panels for inspection introduces exposure to arc flash hazards, even when proper PPE and procedures are followed. By installing a semi-permanent, mounted thermal sensor, routine inspections can be performed remotely, reducing the frequency of panel access and minimizing technician exposure. This aligns directly with the hierarchy of risk control emphasized in NFPA 70E—eliminating or reducing hazards before relying on administrative controls or PPE.

In addition to reducing the exposure risks addressed in NFPA 70E, continuous thermal monitoring supports the condition-based maintenance principles emphasized in NFPA 70B. By tracking thermal trends over time, semi-permanently installed sensors provide early indication of developing faults, enabling proactive maintenance before safety or reliability is compromised.

The TC-90™ is engineered for environments where space is limited and reliability is non-negotiable. Its compact form factor allows for toolless, magnetic installation inside low- and medium-voltage cabinets without interfering with existing components or airflow. Once installed, the camera continuously monitors temperature trends across critical connection points and components, capturing real-time data that would otherwise remain invisible between inspections.



TC-90™ Mounted Magnetically in a Cabinet

What makes continuous monitoring particularly valuable is not just detection, but context. Instead of a single thermal image captured during an inspection window, the TC-90™ builds a historical thermal and optical profile over time. Subtle temperature increases, often early indicators of loose terminations, corrosion, or abnormal loading, can be identified before they reach critical thresholds. This enables maintenance teams to plan corrective actions proactively, rather than responding to alarms, failures, or emergency shutdowns.

Data from the TC-90™ is delivered through SYTIS' InfraSpec™, a software platform that translates raw thermal data into actionable insights. Customizable alarms notify teams when temperatures exceed defined limits or when abnormal trends in temperature difference Δs emerge. For facilities managing multiple sites or large asset portfolios, centralized monitoring provides consistency and oversight that periodic manual inspections alone cannot achieve.

For NETA professionals, this technology represents an evolution in how testing and maintenance programs can be structured. Acceptance testing, commissioning, and routine maintenance remain essential, but continuous monitoring fills the blind spots between those activities. It supports condition-based maintenance strategies, improves documentation, and provides objective data that can be used to validate maintenance decisions.

Importantly, continuous thermal monitoring also supports operational reliability. Unplanned outages carry safety risks, financial consequences, and reputational impact. Early detection of thermal anomalies allows organizations to intervene on their own terms, scheduling repairs during planned outages rather than reacting to failures under pressure.

Electrical safety is not static; it evolves with technology, standards, and experience. As facilities become more complex and expectations for uptime increase, relying solely on periodic inspections is no longer sufficient. The TC-90™ offers a practical, field-ready solution that enhances existing safety programs by extending visibility beyond the inspection interval.

By adding continuous thermal monitoring inside the panel, where risk often begins, organizations can take a meaningful step toward safer, smarter, and more resilient electrical systems.



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- ***Measure Your Aptitude:*** Receive a personalized safety aptitude score to gauge your readiness and identify areas for growth.

