

SUMMER 2026

# NETA WORLD™

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# NETA: STANDING FOR A HIGHER STANDARD

*This Summer edition of NETA World arrives at a pivotal moment for our industry. Demand for electrical testing and commissioning has never been higher, expectations have never been greater, and the pace of change continues to accelerate. Across every segment, from data centers to grid modernization, we are being asked to do more, move faster, and deliver with absolute precision. The articles in this issue challenge us to pause, reflect, and most importantly, rethink how we approach our work.*

A central theme is the need to reclaim the intent behind our processes, especially when it comes to safety. What was designed to be a meaningful pause has, in many cases, become a routine compliance exercise. Safety is not a form or a checklist; it is a mindset and a shared responsibility. Our job briefings must be more than completed; they must be lived, fostering real conversations about hazards, controls, and accountability.

Equally important is the role of culture as a true competitive advantage. In a tight labor market, compensation alone is not enough. Organizations that invest in their people, promote growth and purpose, and foster pride in the work not only retain talent but also elevate performance across the board.

At the same time, our industry must confront a growing disconnect between how work is delivered and how it is now demanded. Increasing speed, scale, and complexity require us to rethink legacy approaches to project execution. This challenge presents a clear opportunity for innovation, aligning our technical expertise with more agile and responsive delivery models.

Underlying all of this is a simple truth: Depth of understanding matters more than ever. Certification, and ultimately excellence in our field, is not about memorization; it is about understanding the “why” behind the work. In an environment where technology can assist with many tasks, it is the technician’s knowledge, judgment, and mastery that define quality and ensure safety.

These messages speak to our identity as an organization. NETA has always stood for a higher standard—not just in testing, but in professionalism, competence, and integrity. As the industry evolves, that standard becomes even more important. Our customers are not simply looking for results; they are looking for confidence that the work was done correctly, that risks were properly managed, and that the people performing the work truly understand the systems they are entrusted with.



IT IS THE TECHNICIAN'S  
KNOWLEDGE, JUDGMENT,  
AND MASTERY THAT DEFINE  
QUALITY AND ENSURE SAFETY.

## PRESIDENT'S DESK

As we look ahead, I encourage each of you to reflect on three simple but powerful questions:

- Are we treating safety as a process or as a practice?
- Are we building cultures that people want to be part of?
- Are we evolving how we deliver work to meet the demands of today's environment?

If we can answer these questions with intention and action, we will not only keep pace with the industry—we will lead it. Thank you for your continued commitment to excellence, to each other, and to NETA's mission.

Stay safe, stay curious, and keep raising the standard.



**Dan Hook, President**  
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# MATT ROBINSON:

## LIFELONG LEARNER, ENTHUSIASTIC TEACHER, HUMBLE INSTRUCTOR

This issue of *NETA World's* “Insight and Inspiration” series features Matt Robinson, Director, Safety and Training at Sigma C Power Services. His current role includes the safety and well-being of all personnel within the organization and the responsibility for safe, high-quality operations of the company. In addition to safety, Robinson’s duties make him responsible for the technical and professional development of the organization’s employees. Robinson earned BS and MS degrees in electrical engineering from Northeastern University and is currently pursuing a DEng at Penn State with a focus on workforce development within the American power industry. He is a NETA Level 4 Certified Senior Technician.



MATT ROBINSON

**NW:** How long have you been in the field, and what was your path to your current position?

**Robinson:** I have been in the field in some capacity for 25 years, starting with my apprenticeship to the electrical department of a large commercial facility the summer after my freshman year of college. I was going to school for electrical engineering, but the shop foreman saw something in me and wanted to challenge me. His words were along the lines

of, “So, you’re going to school for engineering? A lot of engineers spend their whole lives designing installations without ever seeing the real-world issues that go into actually building what they have put on paper. I’m going to make sure you’re different. You’re going to build, and I hope that will make you a better engineer.” It’s amazing to consider the little nudges that aggregate into an overall career trajectory.

I spent that summer hammering out floor boxes, rewiring cubicles, running conduit,

pulling cable, hanging fixtures, replacing ballasts, changing breakers, and dealing with a never-ending flood of tickets from people tripping off panel breakers by running space heaters under their desks during the summer. My university's co-op program offered a six-month class/six-month work rotation after freshman year, and I convinced my advisor that doing my current job for another six months to start my sophomore year would be an excellent use of my time. I worked all three co-op rotations under that same foreman, but my advisor and the people I worked with pushed me to broaden my horizons and seek out additional opportunities instead of getting too comfortable where I was.

Leading up to my final co-op rotation, we gave presentations on our experiences and shared our reflections on the program with the freshmen coming into the program. These presentations were attended by several potential employers who used co-op students as a direct pipeline to full-time hire. A manager from CDM who attended, said he had a position to fill and was having a hard time finding the right candidate from the students they had interviewed. He hired me—another nudge and lucky circumstance.

The position was for a division taking on special projects that the rest of the electrical discipline had no interest in or no expertise to pursue. This included cogeneration, system stability, reliability, coordination, and a host of other system studies I had never touched during my undergraduate degree. My mentor and I were a team of two. He encouraged me to read, pursue my master's degree, research, learn to learn, and get out into the field to get a complete picture of the system I was trying to assess. I earned a reputation for taking every opportunity to get hands-on experience with the equipment I was designing or investigating. Eventually, I wanted more opportunities in the field to apply my engineering degree in a practical way, and I was hired for an engineering position at 3C Electrical. This became my introduction to the world of NETA.



**NW:** What attracted you to the electrical testing field?

**Robinson:** I've always loved the practical diagnostic aspects of testing, disassembling, and testing equipment to determine not only the current condition, but also to trend over time and predict future performance. There is something about taking the raw information our testing provides and interpreting it into a discrete set of actions that feels almost magical to me.

**NW:** Who influenced or mentored you along the way?

**Robinson:** I've been fortunate to have several: Darryl McDonald, the electrical shop foreman who saw my potential and wanted to make me a better engineer; Syed Peeran, my mentor at CDM who taught me how to learn and pushed me to do more academically in my first year of working with him than I had done in my previous 22 years combined; and Sarah Salgueiro, who taught me how to teach and opened my eyes to a world of educational design that I have only begun to tap. Finally, Jim and Stephen Cialdea, Jeff Mannis, and Mike Roach, all who spent so much time helping me find my way and supported my growth into who I am today.

**NW:** What about this work keeps you committed to the profession?

**Robinson:** For me, it's the spark when I see someone get it. It's when a junior technician connects the principles we've covered to the testing they just completed, or when a more senior-level person understands why their power factor results can change so much depending on where they connect their ground. I really believe in Feynman's Razor: *"If you cannot explain something in sensible, accessible terms, then you truly don't understand it."* I live by that maxim. If I haven't been able to relate the concepts of a certain test or work to a technician, it means I have more work to do in terms of learning it for myself.

**NW:** How did you transition from engineering to training?

**Robinson:** At 3C, I quickly learned what it meant to work the full lifecycle of electrical installations, from design to installation, maintenance, and retirement. My first few years with the firm were eye-opening. I also had the opportunity to start teaching at a local university, which ignited my passion for training and professional development. 3C was purchased by CE Power, which became Qualus, and I had the opportunity to

transition to the Qualus University training and development team in 2020.

While I had been teaching for seven years and had hosted several learning seminars before joining the training and development team, my introduction to the team is where I really began to learn about learning, specifically approaches and structures to support adult learning and improve outcomes. This was a period of intense study for me. I had to let go of everything I thought I knew about education and go back to the basics. These years of mentorship were some of the most important for my professional development. I sadly had to say goodbye to my role at Qualus due to a change in family circumstances and later moved on to my current position at Sigma C Power Services, where I can train and develop our staff to my heart's content.

**NW:** How does your early field experience improve your teaching?

**Robinson:** That foreman was absolutely right. Seeing how things went together gave me a thorough education on how the work should be done. The field experience, the lessons learned, the triumphs, and most importantly, the failures, are all things I can and do pass on in every lesson. Not everything gets through to everyone I teach, but relating the concepts I'm teaching to real-world applications—and more importantly, real-world examples of things gone wrong—is an invaluable tool for helping people avoid those same pitfalls while passing on the valuable tribal knowledge that seems to be leaking out of our industry.

Those early experiences are the ones I most want to share, so when I had a chance to get involved with NETA's QEMC/QEMW program and teach some of the first client-facing QEMW prep courses, I jumped at the opportunity. Being in front of technicians at the very start of their journey and passing along the insights I wish I had early in my career is a lot of fun for me. My teaching style uses a lot of self-deprecation, so I don't mind sharing the mistakes I made in a fun, light-hearted way. It

is a good tool to show technicians that mistakes are a way of learning, but that learning from someone *else's* mistakes is a lot less painful.

**NW:** What is the biggest challenge for meeting the rising demand for energy?

**Robinson:** The mismatch between energy demand and infrastructure will be the elephant in the room for the coming generation of energy workers. The pipeline of power professionals has dwindled to almost nothing, companies regularly poach senior talent from each other in an ever-narrowing labor pool, and the demand for workers continues to increase. The rate at which the industry is growing is already unsustainable, and unless we make a major change in how we educate and develop our power and energy professionals, I believe we will experience a major bottleneck to innovation and development.

**NW:** What advice would you give a young person interested in joining the electrical testing industry?

**Robinson:** “Hey kid, want a job that pays well, offers tremendous job security, and won’t be replaced by AI until the robots have taken over the world?” In all seriousness, I strongly recommend this industry. It has proven to be recession-proof and AI-proof, and it offers tremendous upward mobility. To anyone who takes this path, never stop learning. Opportunities to add certifications, degrees, capabilities, and skills to your repertoire are always available. Many companies offer tuition reimbursement, upskilling, or development programs. Take advantage of as many as you can. Your investment in education and development early in your career will pay dividends you cannot imagine down the road. [NW](#)



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# MASCOTS AND ELECTRICAL SAFETY CULTURE ENGAGEMENT:

## ARE YOU REDDY AND WILLIE(ING)?

BY RON WIDUP, *Vector Power*

OK, let's be honest. When you pull NFPA 70E off the shelf, it's not exactly something you look forward to reading for entertainment. Yes, it matters. (It matters a lot!) But it's not built to grab your attention or stick with you. And that's not a knock on the standard. Consensus standards like NFPA 70E serve a clear purpose: to "...**provide a practical safe working area for employees relative to the hazards arising from the use of electricity.**" (Section 90.2 Purpose).

### Disclaimer

"All mascot names are trademarks of their respective owners and are used here for informational purposes only."

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# THE NFPA 70E AND NETA

The problem is this: Knowing the 70E standard and all its rules and guidance...and remembering it in the moment...are two very different things.

Here's a thought: It seems like one of the ways we could capture the attention of our technicians and engineers and drive better engagement would be by using mascots and recognizable characters that people can connect with.

## USING MASCOTS TO DRIVE ENGAGEMENT

There are several recognizable mascots out there, including NFPA's mascot "Sparky the Fire Dog" or the U.S. Forest Service's mascot "Smokey Bear." Side note: Officially, it's not "Smokey *the* Bear." It's just "Smokey Bear."

But what about mascots directly related to electricity or the hazards of electricity? Sadly, we have drifted away from most of them, even those that were front and center in our industry over the last several years and even decades. The electric cooperatives are the most active with mascot usage, but the others? Not so much.

Why is that? Great question. The electrical power industry used mascots heavily when electricity was new and poorly understood because it helped humanize something invisible, took away some of the fear around using electricity, and **importantly**, taught us safe behaviors when around or near electricity. And that's a big deal!

But it seems the electrical power industry abandoned them years ago as we became more technical, more regulated, and get this... "**more comfortable.**" How many times have we heard complacency named as a root cause of an incident?)

Think a little mascot engagement could have helped a few of those incidents where the workers were too comfortable with their task? My guess is that it could have helped a few.

## ENDURING MASCOTS

To emphasize the point of mascot and recognizable character importance, look at the NFPA and the U.S. Forest Service. They have

doubled down on the use of their well-known mascots, Sparky and Smokey, with massive public recognition campaigns and communication, and we have a connection to them. The electrical power industry? Not so much.

It's not to say the electrical mascots are not still around, but let's take a look at a few of them:

### Reddy Kilowatt®

Arguably, the King Daddy of electrical mascots and the first on the scene, Reddy Kilowatt just turned 100-years-old this year. Created in 1926 by Ashton Collins Sr., a general commercial manager for Alabama Power Co. (APC) in Birmingham, Alabama, Reddy entered the electric utility market on March 14, 1926, for Alabama Power to promote electricity to its customers. Happy Centenarian Birthday, Reddy!

Reddy solved a real problem by being designed as a "humanized version of electricity" with lightning bolts for limbs, a bulb nose, and plug ears. Back then, electricity was new, widely misunderstood, and honestly...a little scary. But Reddy gave it a face, and "Your Electric Servant" became the message.

He showed up in appliance ads, safety campaigns, bill inserts, and school materials. Ashton Collins understood that: "People don't buy electrons—they buy what they understand," he said. And Reddy helped to bridge that gap.

Maybe we should vote Reddy back into office and get him more involved with the industry!

### Willie Wiredhand®

Willie Wiredhand has an interesting story in his journey into the world of electricity, which coincided with one of the biggest shifts in U.S. infrastructure. By the 1930s, cities had power, but 90% of the farms did not, and this infrastructure gap led to the passing of the Rural Electrification Act (REA) in 1936, as part of Franklin Delano Roosevelt's New Deal.

The REA provided for the creation of federal low-cost loans to non-profit rural

electric cooperatives, enabling electricity access for millions of rural Americans. This was transformative to agriculture by bringing electric power to farms, homes, and communities.

Seeing a need for education, the co-ops wanted Reddy, but they were told no. Reddy's license for use was controlled by investor-owned utilities, and they refused to share him with co-ops.

So the co-ops, sponsored by the National Rural Electric Cooperative Association (NRECA), built their own identity, created by Andrew McLay in the early 1950s. With plug legs, a wire body, a socket head, and lineman gloves.... enter stage right: one Willie Wirehand!

And his name wasn't random: "Wired hand" was a play on "hired hand" (farm labor), and the messaging was that he was "the never-tiring, always available hired hand to help the nation's farmers."

## Reddy vs. Willie: The Lawsuit!

As soon as Willie was created, the originator of Reddy Kilowatt, Ashton Collins, sued NRECA, stating he was "the originator and owner of figures symbolizing the use of electric energy."

He wasn't successful in his lawsuit (filed in South Carolina), and on appeal, the three judges from the U.S. Court of Appeals Fourth Circuit unanimously ruled that the lower court's decision held, dismissing the complaint on January 7, 1957.

The NRECA successfully countersued for its legal fees, and Willie Wirehand was granted his own trademark by the U.S. Patent Office in 1957. Good job, Willie!

## Mr. Ouch®

Though not a mascot, here's an interesting story on the creation of a hazard symbol or pictorial warning sign originally developed to warn children about the dangers of electricity in and around padmount transformers. To do so, the National Electrical Manufacturers Association (NEMA) created the Mr. Ouch symbol.

NEMA even has a standard written around it, NEMA TP 80049-2025 (formerly NEMA 260), *Safety Labels for Pad-Mounted Switchgear and Transformers Sited in Public Areas*.

The Foreword of the standard states, in part:

*In early January 1981, several member companies of the NEMA Transformer Section indicated a strong desire to reduce the number of accidents involving children coming into contact with the active elements of pad-mounted transformers located in public areas.*

*The Executive Committee charged a Task Force to develop a safety label that would warn small children away from an open pad-mount and simultaneously elicit an adult's attention to contact the owner of the pad-mount to remove the hazard.*

Mr. Ouch is designed as an "anthropomorphized electrical arc," appearing as a snarling, octopus-like creature with lightning tentacles tossing a child backward.

OK, I had to look it up, too. According to Merriam-Webster, "anthropomorphize" means to attribute human form, personality, or characteristics to nonhuman things, such as animals, plants, or material objects. Regardless, it's a very effective non-verbal graphical representation of the hazards of electricity. Think about that.

## AUTHOR'S FINAL NOTES

So why write an article about electrical mascots? A couple of reasons, actually. First and foremost, if we can do anything to improve worker safety and retention of knowledge for safe work practices, then we'll call that a win. Introducing a mascot into your electrical safety program might just do that.

But be careful about using copyrighted symbols and assets. For the Spring 2026 edition of *NETA World*, in the article titled "The Most Dangerous Electrical Task You Do Every Day," we had intended to use a photo of Willie Wirehand for the lead photo. It was a small

# THE NFPA 70E AND NETA


bobblehead figurine of Willie that I owned, and I had taken a photo of him with an old meter in the background. But after researching copyright rules, we couldn't get permission to use the photo. However, that rejection

inspired me to think about the value of using mascots for electrical safety knowledge and education.... so here we are.

Second, remember that these characters are tools. They help us tackle real challenges, such as getting NFPA 70E to stick, helping us to keep pace with this transformational industry growth we are currently experiencing, and reinforcing the basics of electrical safety. Reddy and Willie didn't complicate the message—they made it simple—and that's why it worked.

By the way, here's a photo of my laptop in my home office. But don't blame me for any issues with the mascot decal! I got it on Etsy.

So...listen to Reddy, Willie, Sparky, Smokey, Mr. Ouch, and the rest of the cast of characters....and "Test Before Touch," because "Remember, kids, **Electricity Will Kill You.**"

Be safe out there. 



## RESOURCES

Learn more about **Sparky the Fire Dog**® here:

<https://www.nfpa.org/about-nfpa/about-sparky-the-fire-dog>.

Learn more about **Smokey Bear** here: <https://smokeybear.com/smokeys-story>.

The image and likeness of Smokey Bear is a Congressional trademark protected by federal law and is not in the public domain.



Learn more about **Reddy Kilowatt**® from Xcel Energy here:

<https://stories.xcelenergy.com/stories/The-face-of-electricity--Celebrating-98-years-of-Reddy-Kilowatt>.

Learn more about **Willie Wiredhand**® brand usage from NRECA here:

[https://www.cooperative.com/programs-services/communications/brand-and-usage-guides/Documents/Willie\\_Wiredhand\\_StyleGuide.pdf](https://www.cooperative.com/programs-services/communications/brand-and-usage-guides/Documents/Willie_Wiredhand_StyleGuide.pdf).



**Ron Widup** has worked in the electrical power testing and maintenance industry for more than 45 years. He serves as Chief Technical Marketing Officer for Vector Power in Plano, Texas. Ron has been an active member of several NFPA technical committees, including NFPA 70E, NFPA 70B, NFPA 790/791, and NEC CMP-11. He serves on the InterNational Electrical Testing Association (NETA) Board of Directors and the NETA Standards Review Council. He is also Chairman of IEEE P902, IEEE Recommended Practice for Maintenance and Operational Safety of Electrical Power Distribution Systems in Industrial and Commercial Facilities. Ron currently serves as Chairman of the Texas State Technical College (TSTC) System Board of Regents. His credentials include NETA Certified Level

4 Senior Test Technician, State of Texas Journeyman Electrician, NFPA Certified Electrical Safety Compliance Professional (CESCP), and Senior Member of IEEE.

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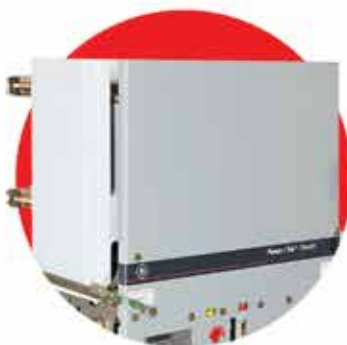


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# ON VOLTAGE DIVIDERS: APPLICATIONS AND HAZARDS

BY MICHAEL LABELIT, *RESA Power*

Voltage dividers are simple devices consisting of series circuits that produce two or more lower voltages from a single source voltage via resistances. This is possible because of this mathematical fact: Given a series circuit with multiple resistances, the sum of the absolute values of all voltage drops across each resistance will equal the source voltage.

This fact is illustrated most conspicuously in voltage sensors. Voltage sensor instruments are an alternative to potential transformers. They are installed to report high voltages for metering or protection purposes. Suppose a protection and control (P&C) engineer needs a device capable of reporting a 50-kV phase-

to-ground voltage safely to a metering or protection relay. A single-bushing potential transformer could be deployed to do the job. As an alternative, they could install a voltage sensor.

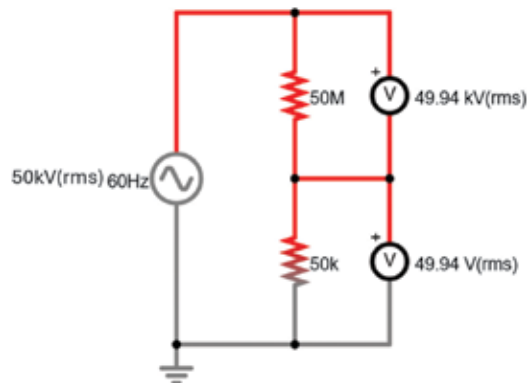
## CASE STUDY

Suppose this 50-kV voltage sensor contained two serial resistors, one 50 MΩ and one 50 kΩ (Figure 1).

The voltage  $V_2$  across the 50-kΩ resistor is a function of the primary voltage  $V_p$  and both resistors ( $R_1 @ 50\text{M}\Omega$  and  $R_2 @ 50\text{k}\Omega$ ) where:

$$V_2 = \frac{V_p R_2}{R_1 + R_2}$$

In this way, voltage sensors act like potential transformers; they step the primary voltage down to a level tolerable for protection and control devices. With the example voltage



**Figure 1:** Voltage Sensor Circuit Built Using the Falstad Circuit Simulator Applet



PHOTO: © ISTOCKPHOTO.COM/PORTFOLIO/ALACATR

sensor, you could theoretically use a low-voltage device such as a multimeter to confirm transmission voltage.

Note that capacitors and inductors can divide voltages just as readily as resistors via capacitive and inductive reactance, respectively, provided that the source voltage is alternating and not direct. Hence, hypothetical impedances  $Z_1$  and  $Z_2$  will replace resistances  $R_1$  and  $R_2$  in an AC voltage divider containing a combination of resistances and reactances.

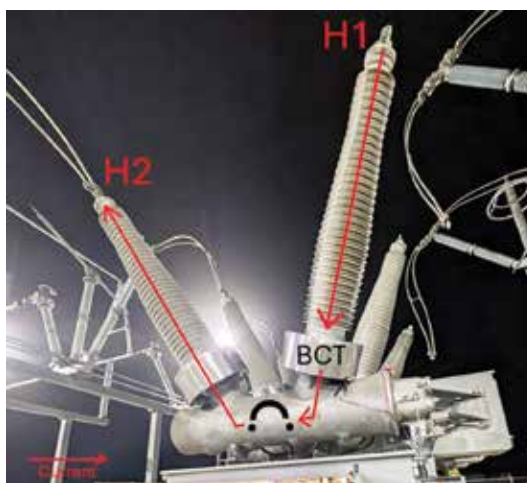
## HAZARDS

As is so often the case in electrical engineering, circuits can act as tools or as hazards. Here are two specific hazards posed by voltage dividers that I've encountered in the past year as a test technician.

### Ungrounded Frames

Last December, I was tasked with testing bushing current transformers (BCTs) at a large wind substation. This included testing the BCTs inside two 362-kV SF6 circuit breakers.

These BCTs were hidden beneath grounded metal shrouds; the pole number was posted on them (three phases, six poles). You must connect your test set to the BCT H1 and H2 terminals to test them. This can be done by closing the breaker and then using the line and load bushing terminals for that particular phase as your H1 and H2 points (Figure 2).



**Figure 2:** Bushing Terminal Setup Showing Direction of Flow

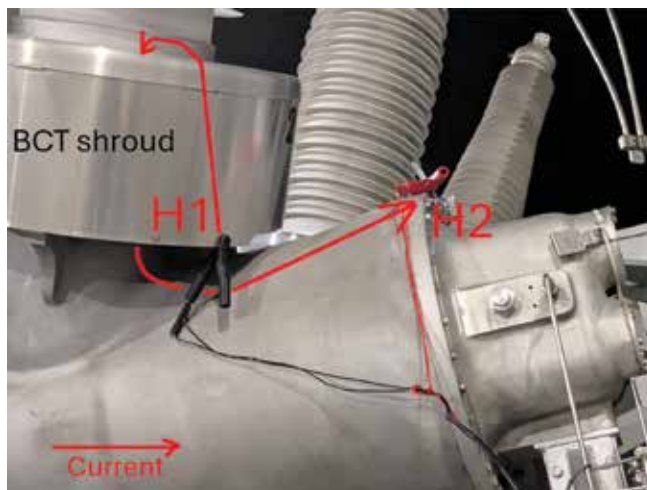
## IN THE FIELD

This is easy on 38-kV breakers and below, but nightmarish on 362-kV breakers because of the distances your leads must travel. As an alternative to high-voltage breakers, I use the lip of the BCT metal shroud as my H1 and the breaker frame as my H2 (Figure 3a and 3b). This works because the shroud (at least on some breaker models) routes through the center BCT just like the bushing conductor and then bonds to the grounded breaker frame.

I made my connections with my CT test set but kept getting an Open CT Primary fault



**Figure 3a:** *Proper CT Shroud Bonding*



**Figure 3b:** *BCT Shroud Alternate Setup*

message, meaning there was no continuity between the H1 and H2. After more than an hour of troubleshooting (checking the test leads, replacing the test set, checking different BCTs, etc) I discovered that the culprit was the BCT shroud itself. It was, bafflingly, ungrounded, i.e., floating (Figure 4).



**Figure 4:** *Ungrounded BCT Shroud*

I still don't understand how the shroud managed to be firmly bolted to the frame and still remain ungrounded, but my test sets didn't lie. The hazard that arises from this comes in the form of a voltage divider.

The impedance  $Z_1$  between the bushing conductor and the metal shroud is likely to be exceedingly high—on the order of 1 T $\Omega$ . Suppose the impedance  $Z_2$  between the shroud and ground is 2.5 G $\Omega$ . There are capacitive reactances between these components as well, but their effect on the impedances will be negligible. If we plug these values into the voltage divider (200 kV is  $V_p$ , 1 T $\Omega$  is  $Z_1$ , and 2.5 G $\Omega$  is  $Z_2$ ), then the resultant voltage  $V_2$  between the shroud and ground will be 499 V. That voltage presents a serious risk of severe injury if someone were to accidentally come into contact with the shroud while the unit is energized.

### Test Set Grounding

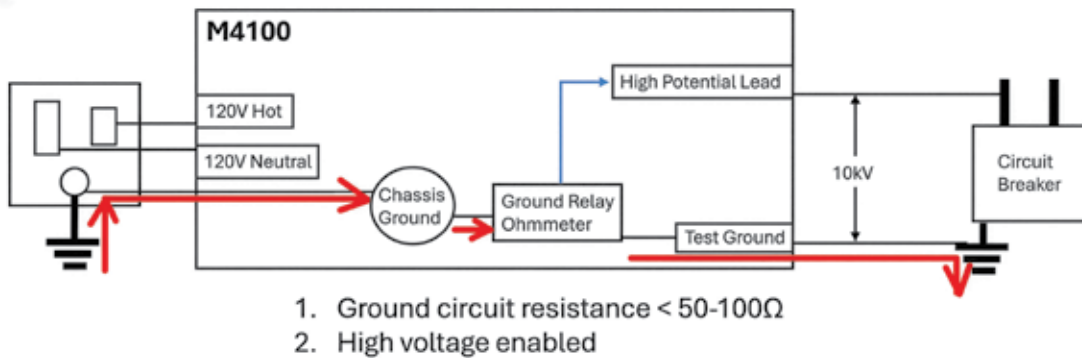
Test technicians are masters at improvising, often without thinking of the consequences or other risks they are introducing into the system under test. One example that can have deadly results is bypassing the power-factor test set ground relay. I see this most commonly on Doble M4100 test sets, but I would not be surprised if techs made similar contraptions for other test sets.

The function of the ground relay on a power factor test set is to de-energize the high-potential lead should a break in the ground relay circuit occur. That circuit includes the ground relay ohmmeter, the test ground, the asset ground, the power source ground, and the chassis ground. If the ground relay ohmmeter calculates less than 50–100 Ω between the test ground and the chassis ground, the voltage between the high-potential lead and the test ground is enabled (Figure 5). Otherwise, it disables the voltage on the high-potential test lead.

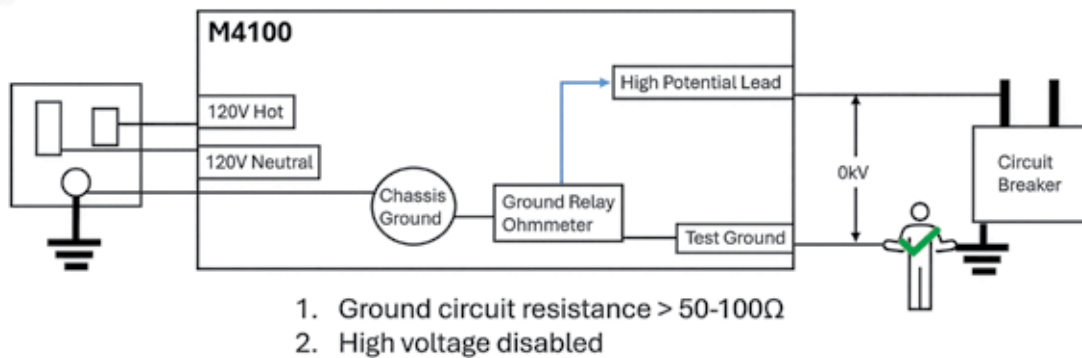
In the event that the test ground is inadvertently removed from the asset ground during testing, the high-potential lead’s function as a safety feature to ensure all lethal voltages are immediately terminated is deactivated .

Test technicians often find themselves on job sites where utility power is not available, so portable generators are utilized to power the test equipment. Bonding the generator to the same ground grid as the asset under test is often overlooked. By not properly bonding the generating source of power to ensure there is a complete grounding path, the ground relay circuit, by design, will disable the unit.

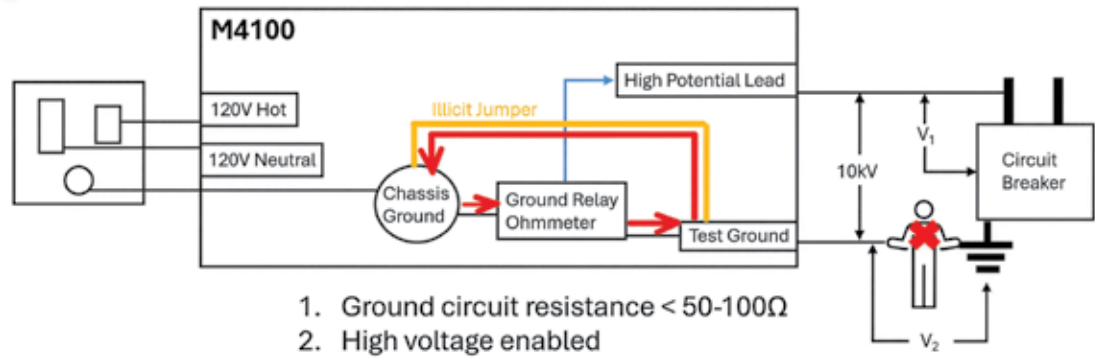
As a workaround, technicians defeat this safety feature by bonding the chassis ground directly to the test ground with an illicit jumper (Figure 7 and Figure 8). This ill-advised and dangerous practice establishes continuity between the chassis ground and the test ground, thereby



**Figure 5:** *Proper Setup* SOURCE: PRINTED WITH PERMISSION FROM RICHARD MALDONADO



**Figure 6:** *Proper Setup with Accident* SOURCE: PRINTED WITH PERMISSION FROM RICHARD MALDONADO



**Figure 7: Improper Setup with Accident** SOURCE: PRINTED WITH PERMISSION FROM RICHARD MALDONADO



**Figure 8: Illicit Jumper**

satisfying the ground relay 50–100-Ω resistance condition and re-enabling the high-potential lead, but bypassing the asset ground and the power source ground.

If the asset ground is inadvertently removed or overlooked during installation, the high-potential lead will remain energized because the ground relay ohmmeter was tricked into believing the grounding path was complete. A voltage divider will establish itself, where the primary voltage  $V_p$  between the high-potential lead and the test ground will remain intact (10 kV in this case). Unfortunately, it

is the technician who will complete the path to ground from the specimen under test, with potentially deadly results.

## CONCLUSION

Ungrounded systems allow components to float, and hazardous voltages may emerge between floating components and ground. The two hazards described here are prevented via proper grounding, by grounding all non-current-carrying conductors in a circuit breaker or creating a comprehensive ground loop with a test set.

Moreover, test set manufacturers such as Doble, Megger, and OMICRON specifically design their equipment to operate a certain way. They know more about their merchandise than you do. If you find yourself having to be creative in order to operate a piece of test equipment, it's highly likely something is wrong with your setup, not with the unit itself. [\[1\]](#)

## REFERENCE

Paul Falstad. Circuit Simulator Applet. Free to use at <https://www.falstad.com/circuit/>.



**Michael Labeit** is a Prime Power Production Specialist, Lineman, a Power Systems Technician for RESA Power, and a NETA Level 3 Technician in the 249th Engineer Battalion, U.S. Army Corps of Engineers. He has operated and maintained medium-voltage power plants in Turkey and Saudi Arabia as well as at Ft. Leonard Wood, Missouri, and Ft. Bragg, North Carolina. Labeit graduated from Prime Power School in 2018 and has an AAS from Excelsior College.



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# USING AI TO DO AN ENGINEER'S WORK

BY STEVE TURNER, *Consultant*

Recently, I challenged a proprietary AI platform to solve a simple protection problem:

*Use a CO-9 overcurrent relay to provide backup protection for a 150 MVA transformer; the high-side voltage is 230 kV. Plot the characteristic of the CO-9 versus the transformer damage curve.*

This was not an especially difficult problem to solve. I wanted to see if it would fail to accurately answer the question or if it would crash. I also input the same challenge to a free AI program.

The proprietary AI platform was much more effective than the free AI platform, which only provided the equation but would not plot it. This solution made the same decisions I would have made and provided a usable solution that matched my manual solution.

The following blocks represent the technical response from the proprietary platform.

## 1. Transformer base current (high side)

3-φ, 150-MVA, 230 kV:

$$I_{\text{rated}} = \frac{S}{\sqrt{3}V_{LL}} = \frac{150 \times 10^6}{\sqrt{3} \times 230 \times 10^3} \approx 377\text{A}$$

Use this as 1.0 pu winding current.

PHOTO: © STOCK.ADOBE.COM/CONTRIBUTOR/211259445/SKIMP-ART

## 2. Choose CT and CO-9 pickup

Assume a 400/5 CT on the 230-kV side:

- CT secondary full-load current

$$I_{\text{sec,FL}} = 377 \times \frac{5}{400} \approx 4.7 \text{ A}$$

Pick a CO-9 tap = 6 A, so:

- Relay pickup (secondary):  $I_p = 6 \text{ A}$
- Relay pickup (primary):  $I_{p,\text{pri}} = 6 \times \frac{400}{5} = 480 \text{ A}$

So:

$$\frac{I_{\text{rated}}}{I_{p,\text{pri}}} = \frac{377}{480} \approx 0.785$$

Multiples of relay pickup are:

$$M = \frac{I}{I_p} = \frac{I/I_{\text{rated}}}{I_p/I_{\text{rated}}} = \frac{k}{I_{p,\text{pri}}/I_{\text{rated}}} = \frac{k}{480/377} \approx 0.785 k$$

where  $k = I/I_{\text{rated}}$  (multiple of transformer rated current).

## 3. Transformer damage curve (IEEE C57.109 Category IV)

For a 150 MVA oil-filled power transformer, use Category IV through-fault (thermal/mechanical) curve per IEEE C57.109. The standard table in SKM's guide reproduces it as:

$I/I_{\text{rated}}$	Time to damage(s)
2.0	1800
3.0	300
4.75	60
6.3	30
11.3	10
25	2

These are the points you plot for the transformer damage curve on a log-log TCC, using 377 A as 1 pu current.

If you want primary-amp values:

- e.g. 25 pu point =>  $I = 25 \times 377 \approx 9.4 \text{ kA}$  at .2 s, etc.

#### 4. CO-9 inverse-time equation

A widely used analytical fit for the Westinghouse/ABB CO-9 very-inverse curve is:

$$T = \frac{5.4678 D}{M^{2.0469} - 1} + 0.10814 D + 0.0280$$

Where:

- $T$  = trip time (s)
- $D$  = time-dial setting
- $M = I/I_p$  = multiple of relay pickup current

This is very close to the manufacturer's published curve.

Pick, for example, time-dial  $D = 2$  for a reasonably fast backup characteristic.

#### 5. Sample coordination check (numeric points)

Translate transformer damage points into  $M$  (multiples of pickup) using  $M \approx 0.785k$ :

$k = I/I_{\text{rated}}$	Damage time (s)	$M \approx 0.785k$ :
2.0	1800	1.57
3.0	300	2.36
4.75	60	3.73
6.3	30	4.94
11.3	10	8.86
25	2	19.6

Now compute CO-9 times with  $D = 2$  at the same currents (you'd actually do this in Mathcad/Excel):

- Example at 25x rated:  $M \approx 19.6$

$$T \approx \frac{5.4678 \times 2}{19.6^{2.0469} - 1} + 0.10814 \times 2 + 0.028 \approx 0.27 \text{ s}$$

Compare to transformer damage 2.0 s at the same current => relay trips well before damage limit.

You can similarly evaluate at  $k = 11.3, 6.3$ , etc.; with  $D \approx 2$  the CO-9 times will all be comfortably below the table damage times over the fault current range of interest, while still slow enough at low multiples not to act as overload protection.

## 6. How to plot (practical steps)

### 1. Set up axes:

- X-axis: log current using multiples of transformer FLA (1, 2, 3, 5, 10, 20, ...).
- Y-axis: log time (0.01–10,000 s).

### 2. Plot transformer damage curve:

- Mark the six points from Section 3 at current =  $k \times 377$  A and the listed times; connect smoothly.

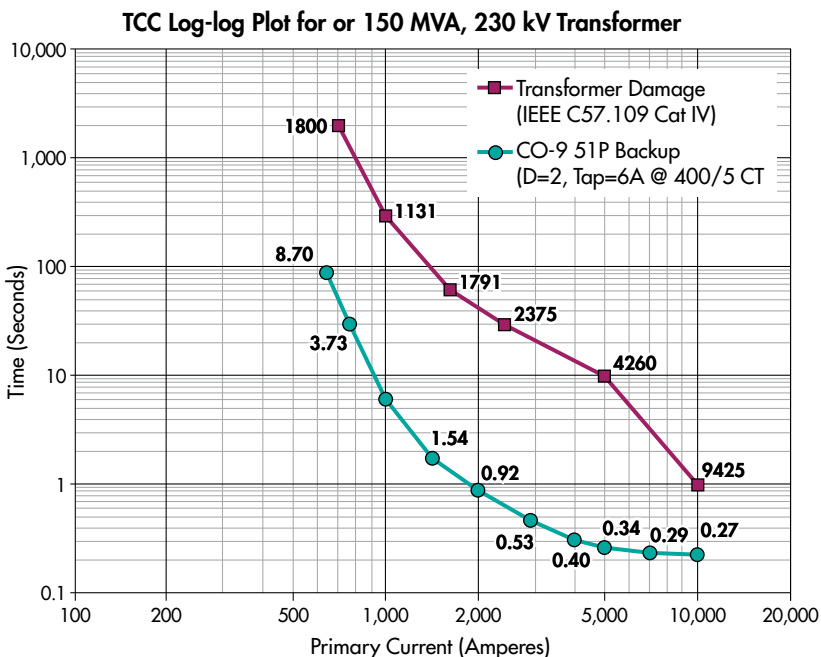
### 3. Plot CO-9 curve:

- For a set of multiples  $M$  (e.g. 1.1, 1.3, 2, 3, 4, 6, 8, 10, 15, 20), compute  $T(M)$  with the CO-9 equation and your chosen time dial  $D$ .
- Convert  $M$  back to primary amps if you want everything in primary terms:  
 $I = M \times I_p$ .
- Plot those points and connect.

### 4. Verify coordination:

- Everywhere above  $\sim 2x$  rated current (where through-faults matter), the CO-9 curve should lie to the left (shorter time) of the transformer damage curve.
- If the curves are too close, slightly reduce  $D$ ; if CO-9 is too fast and creates selectivity issues, increase  $D$  and recheck.

With the numbers above (CT400/5, tap 6 A, CO-9 TD  $\approx 2$  and IEEE C57.109 Category IV curve), you can quickly generate the TCC in your preferred tool and visually see the CO-9 backup curve sitting safely below the transformer damage curve over the fault range.



## CONCLUSION

The proprietary AI platform followed a standard approach for selecting the CT ratio and pertinent CO-9 settings. It was also able to plot the overcurrent characteristic versus the transformer damage curve. [NW](#)



**Steve Turner** is a Consultant at Sargent & Lundy. He was previously in charge of system protection for the Fossil Generation Department at Arizona Public Service Company for five years. Turner formerly held positions at Beckwith Electric Company, GEC Alstom, SEL, and Duke Energy, where he developed the first patent for double-ended fault location on overhead high-voltage transmission lines and was in charge of maintenance standards in the transmission department for protective relaying. He has BSEE and MSEE degrees from Virginia Tech University. Turner is an IEEE Senior Member and a member of the IEEE PSRC and has presented at numerous conferences.



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# CPR: THE FIRST LINK IN THE CHAIN OF SURVIVAL

BY CHARLIE SIMPSON, *Asplundh Electrical Testing, LLC*

In October 2025, the American Heart Association (AHA) released the first full revision of its Guidelines for Cardiopulmonary Resuscitation (CPR) and Emergency Cardiovascular Care (ECC) since 2020. The AHA maintains that cardiac arrest claims more lives globally than colorectal cancer, breast cancer, prostate cancer, influenza, pneumonia, auto accidents, HIV, firearms, and house fires combined.

Cardiac arrest is an immediate occurrence, triggered by an electrical malfunction in the heart that causes an irregular heartbeat (arrhythmia). When the heart stops beating, blood is not pumped to the brain, lungs, and other organs. Seconds later, a person becomes unresponsive and stops breathing. Death occurs quickly if the person does not receive immediate CPR.

A heart attack, on the other hand, is a circulation problem when blood to the heart is stopped by a blocked artery. If the artery is not opened quickly, the part of the heart nourished by the artery begins to die. Symptoms of a heart attack may be immediate, but they more often begin slowly and persist for hours, days, or weeks. Symptoms include chest pain or discomfort, cold sweats, shortness of breath, nausea, and vomiting. For women, symptoms can also include back and jaw pain. If you are experiencing these symptoms, even if you are not sure it is a heart attack, seek medical help immediately.

## KEY RISK FACTORS FOR ELECTRICAL WORKERS

Electrical shock, which can cause immediate, life-threatening cardiac arrest, is the obvious concern in the electrical testing industry when considering causes for cardiac arrest. However, other factors are also associated with this career. For example, physical strain and stress caused by heavy lifting, awkward positions, and job pressures contribute to higher rates of cardiovascular issues.

An unfavorable lifestyle brought about by inconsistent schedules can lead to unhealthy eating and a lack of exercise. Environmental exposures such as inhaling fumes or particulates from old buildings can cause lung damage, affecting overall health.

The best way to mitigate some of these risks is to follow standard safety protocols. Always use proper personal protective equipment (PPE) to prevent electric shock, burns, and falls. Focus on healthy eating, stay hydrated, and



PHOTO: © ISTOCKPHOTO.COM/PORTFOLIO/PEOPLEIMAGES

maintain a consistent exercise routine. Manage stress by taking breaks, stretching, and finding ways to decompress. Schedule annual physicals with your doctor. Finally, be aware of warning signs like chest pain, shortness of breath, and irregular heartbeats, and seek medical help immediately.

## CARDIOPULMONARY RESUSCITATION

According to the AHA, about 350,000 cardiac arrests occur outside the hospital each year in the United States, with a survival rate of less than 10%. CPR is a lifesaving technique involving chest compressions that is useful in many emergencies, including cardiac arrest, where someone's breathing or heartbeat has stopped.

When the heart stops, the absence of oxygenated blood can cause irreparable brain

damage in just a few minutes. Death can occur within 8 to 10 minutes; therefore, time is critical when you're helping an unconscious person who isn't breathing.

The reality, however, is that far too few Americans know how to perform CPR or first aid. When people experience cardiac arrests in public or in their homes, there is often simply no one around who knows how to help them.

CPR training equips people who are not medical professionals with the skills to act in cardiac emergencies, keeping blood and oxygen flowing until paramedics arrive, thereby bridging the time gap in the AHA's chain of survival.

Knowing how to perform CPR empowers bystanders to save the lives of family, friends, or strangers in any location. Initiating CPR right





away will increase a person's survival time until advanced medical care arrives and can take over.

According to Gayle Keagy, Firefighter, EMT, and CPR Instructor, "CPR is highly effective, doubling or tripling survival chances when started immediately after cardiac arrest." This is especially true outside of a hospital. Keagy continues, "Survival rates for out-of-hospital cardiac events are around 10% to 13%, but effective bystander CPR can dramatically boost this rate. Some studies show nearly two times better (11% to 23%) survival chance." In fact, some studies indicate that bystander CPR within two minutes can increase survival chances by 80%.

Each minute of delay in providing CPR reduces survival chances by about 10%. Keagy further notes, "Brain damage can occur in minutes due to the lack of oxygen," in the following time frames:

- 0–4 minutes: not likely to develop brain damage
- 4–6 minutes: possibility of brain damage
- 6–10 minutes: high probability of brain damage
- More than 19 minutes: high likelihood of brain death or severe, irreversible damage.

### BY THE NUMBERS: KEY FACTORS INFLUENCING SURVIVAL

- Approximately 70% of out-of-hospital cardiac arrests occur in private homes. Knowing CPR skills means you are most likely to save a family member or friend.
- Starting quickly doubles or triples survival chances.
- When CPR is combined with an AED, survival rates can jump from roughly 9% (CPR alone) to 38% or higher if a shock is delivered.
- For every minute that passes without CPR or defibrillation, the chance of survival can drop by 10%.

## AUTOMATED EXTERNAL DEFIBRILLATOR

An automated external defibrillator (AED) can be used to help those experiencing sudden cardiac arrest. According to Mitch Shapiro, owner of Shapiro Fire Protection and Chief of the Warminster, Pennsylvania, fire department, "Modern AEDs are designed for laypeople. They are a powerful, yet easy-to-use, tool that analyzes a heart's rhythm and, if necessary, delivers an electrical shock to re-establish an effective rhythm."

Shapiro knows this firsthand. While watching his son's basketball game, he saw the team's coach collapse. He started CPR and remembered seeing an AED in the hallway. While another bystander continued CPR, Shapiro grabbed the AED. He applied the leads, and the device delivered two shocks, returning the heart to a normal rhythm. The coach was transported to the hospital and made a full recovery.

Unfortunately, the number of patients treated with an AED applied by a bystander remains low, occurring in only 10% of public cardiac arrest incidents. However, of those people with cardiac arrest who receive a shock from an AED in the first minute, 9 out of 10 survive.

## WHAT DO OSHA AND NFPA SAY?

The basic purpose of OSHA and NFPA standards is to ensure that adequate first aid is available in the critical minutes between the occurrence of an injury and the arrival of professional care for the injured employee.

### OSHA

In 29 CFR 1910.151(b), OSHA clarifies that it does not mandate CPR or first aid training for all office employees as a blanket rule. What OSHA does require, for general industry, which includes most offices, is this: If you do not have an infirmary, clinic, or hospital "in near proximity," then "a person or persons shall be adequately trained to render first aid."

OSHA's interpretation letters have explained how it typically enforces "near proximity." For workplaces where serious injuries are

possible (falls, suffocation, electrocution, amputation, etc.), OSHA has interpreted near proximity to mean emergency care available within about three to four minutes if you're relying on outside responders rather than trained employees on-site.

For lower-hazard workplaces like offices, OSHA says a somewhat longer response time—up to about 15 minutes—may be reasonable, because the likelihood of severe injuries is less. OSHA also emphasizes that employers should confirm EMS availability if relying on off-site responders, bearing in mind that EMS response times can average 8 to 12 minutes depending on the region. OSHA's baseline requirement is for prompt first aid to be available, not mass certification.

The good news is that many offices choose to train a reasonable number, if not all, of employees per shift or floor. Another consideration is that your need for trained first-aid responders increases if your office is remote or you cannot realistically get EMS help quickly.

### NFPA

NFPA 70E, *Standard for Electrical Safety in the Workplace*, 110.4(C) states:

*Employees responsible for responding to a medical emergency shall be trained in first aid and emergency procedures, as well as in the use of an AED, if the employer's response plan includes such a device.*

*Training shall occur at the frequency that satisfies the requirements of the certifying body.*


NFPA further states that:

*...employers shall verify at least annually that the employee training required by 110.4(C) is current.*

## CONCLUSION

An employer must ensure prompt first aid treatment for injured employees, either by providing a trained first aid provider at the worksite or by ensuring that emergency treatment services are within reasonable proximity.

Immediate bystander intervention is the crucial first link in the chain of survival. Being first aid or CPR-certified empowers people to act quickly with confidence, and ongoing training reduces hesitation and panic in high-stress situations, allowing decisive action.

To find a CPR course near you and to learn these lifesaving skills, visit [www.cpr.heart.org](http://www.cpr.heart.org). 

## REFERENCES

American Heart Association. Guidelines for Cardiopulmonary Resuscitation (CPR) and Emergency Cardiovascular Care (ECC), 2025.

Occupational Safety and Health Administration. OSHA 29 CFR 1910.151, *Medical Services and First Aid*, 1998.

Occupational Safety and Health Administration. Interpretation Letters, 2007.

National Fire Protection Association. NFPA 70E–2024, *Standard for Electrical Safety in the Workplace* (110.4(C)).



**Charlie Simpson** has been a Safety Manager for Asplundh Electrical Testing, LLC since 2006. He has been a first responder for 35 years, including 12 years working as a state-certified fire suppression instructor.





— No. 152 —

## PRESENCE OF VOLTAGE

BY MORGAN GIENI, *Magna IV Engineering*

Electrical safety standards exist to help us work safely on or around electrical equipment. One key element in avoiding electrical hazards is identifying energized parts. NETA Certified Technicians must do everything possible to eliminate their exposure.

1. What is the best information source for selecting isolation points when preparing an isolation plan?
  - a. Schematic diagram
  - b. Single-line diagram
  - c. Visual inspections
  - d. Process and instrumentation diagram
2. Which of the following isolation steps is performed last?
  - a. Apply locks to isolation points
  - b. Test for potential
  - c. Rack out the breaker
  - d. Apply temporary protective grounds
3. If known energized electrical equipment is in the work area, it is best practice to:
  - a. Postpone the job
  - b. Identify it with appropriate alerting techniques
  - c. De-energize the equipment
  - d. File a complaint
4. When taking a partial outage on a switchgear, it is important to:
  - a. Identify any sections containing energized parts with red flagging
  - b. Communicate the need to test for voltage with the crew
  - c. Prohibit entry into energized sections
  - d. All of the above
5. Once work begins, what action should you take whenever you enter a section for the first time?
  - a. Call out to other personnel
  - b. Test for the presence of voltage
  - c. Flash-off terminals with a jumper
  - d. Ask your job lead for permission
6. How must a protective relay be isolated to control the shock hazard?
  - a. Isolate wiring when injecting from a test set
  - b. Ensure any associated breakers are isolated
  - c. Isolate potential transformers
  - d. All of the above
7. How can equipment still be energized with system voltage when it is part of a lockout?
  - a. Failed isolation point
  - b. Outdated drawing
  - c. Temporary generator applied
  - d. All of the above



**Morgan Giени, CET, PSE**, is the Technical Support Lead — Technical Field Services (TFS) at Magna IV Engineering. He is an ASET Certified Engineering Technologist and a NETA Level 4 Certified Senior Technician and is on NETA's Technical Resource Committee.

See answers on page 102.

# TR4



## Raytech TR4: Three-Phase Transformer Turns Ratiometer+

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At the heart of the TR4 is efficiency. An internal multiplexer enables a one-time test connection on both the primary and secondary. Included with the TR4 is the ability to test Phase Shifting Transformers and Magnetic Balance measurements. The updated integrated tap control interface enables fully automated test sequences, reducing operator involvement while improving repeatability. The user-interface allows test object profiles and template creation that will create PDF reports internally. Users can also choose to export files to integrate with external software. Integrated LAN and USB ports allow for remote PC control and storing results on portable devices.

The TR4's capabilities stem far beyond standard testing. Optional integrated diagnostic software such as Frequency Response of Stray Losses (FRSL) and Short Circuit Impedance (SCIMP) give crucial insight into transformer condition while assessing for overall efficiency. The TR4 functionality enables detection of inter-strand short circuits, winding deformation, and other hidden issues before they lead to costly failures.



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Parameter	Measuring Range	Accuracy	Resolution
Current	0...1A	± 1.00 % Rdg ± 0.01A	4 Digits
Phase Angle	±90° @ 55Hz	± 0.05° ± 1 LSD	4 Digits or 0.01°
Output Voltage	0-250VAC	± 1% ± 1 LSD	4 Digits or 0.1VAC
Temperature	0-70°C	± 0.2°C ± 1 LSD	± 0.1°C

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# DATA CENTER GROUND TESTING

BY LEE HOWARD and JACOB RIOUX, *Hood Patterson & Dewar*

The fall of potential (FoP) test to measure the ground impedance of a data center building or substation is commonly specified as part of start-up and commissioning testing. This test procedure is spelled out in IEEE Std. 81, *IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Ground System*. To obtain good data, a properly executed test must meet many caveats and conditions.

Two main requisites are frequently missed or ignored:

1. The facility under test must be de-energized and isolated from all external grounds, including:
  - a. Utility power/substation
  - b. Temporary power
  - c. Water/gas
  - d. Other buildings (campus)
2. The current return probe must be located five to 10 times the longest length (usually diagonal) of the facility under test.

Other known issues related to FoP testing include interference from other metallic buried objects, stray currents and noise, low signal-to-noise ratio, and no interpretation of the data.

Sites often believe they are isolated, but experience has led us to test continuity upon arrival. We often find that the facility is bonded to something. As it is often impossible or impractical to isolate the site, this condition means the test diagonal distance is now larger than previously planned, and the current-return probe must be located farther away based on the new diagonal.



shortcut is that most sites today cannot be isolated, are not in homogeneous soil, and are likely near a built-up environment that rules out perfect conditions for this version of a ground test.

The following examples illustrate common ground testing mistakes and challenges for data centers and their substations.

### EXAMPLE 1: DATA CENTER SUBSTATION, OHIO

To test this site, two attempts using FoP were made. The testing personnel, who were told the site was isolated, proceeded with a standard FoP test without confirming the site's isolation through a continuity test. In reality, the site was connected to three utility feeder lines and not isolated, invalidating the measured data in both cases.

IEEE Std. 81 also mentions a subset of the FoP test: the 62% rule. In homogeneous soil under perfect conditions, the impedance value is approximately 62% (61.8% mathematically) of the distance from the site on a graph of resistance versus distance. This has led to a shortcut in performing testing at the 62% point (and a couple of points on either side of 62%) and reporting this number as the facility's resistance to ground. The problem with this

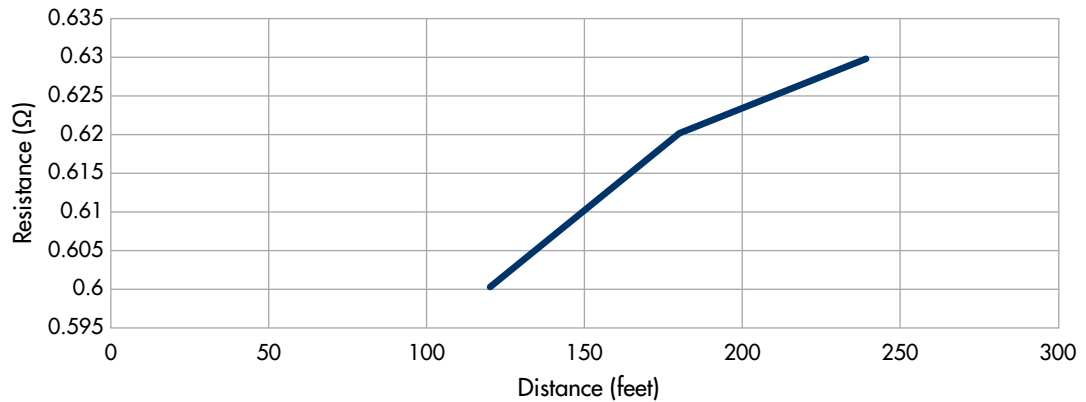
This site was successfully tested using a computer-based multimeter as prescribed in IEEE Std. 81. This method does not require de-energization or isolation and reduces the distance required for the current return probe to twice the diagonal distance of the site under test (Figure 1).



**Figure 1:** Data Center Substation, Ohio, Using Computer-Based Multimeter

Ground Resistance reading:  $0.62 \Omega$  @ 188.7 Feet

Change in Slope (u):  $\frac{0.50}{188.7}$  Feet



**Figure 2:** Data Center Building, Georgia, Using FoP Test

**EXAMPLE 2: DATA CENTER BUILDING, GEORGIA**

This site was first tested with the FoP method. The building has a 1,400-foot diagonal; five times that distance is 7,000 feet. The testers went 300 feet from the building and reported a reading of 186 feet (62%) as the building’s ground resistance value (Figure 2). This is an invalid test for several reasons:

- They didn’t go far enough with the current-return probe
- They relied on 62% rule—not valid at this site

- They needed to develop a complete test curve (measure every 10%)
- They didn’t confirm that the building was isolated

The site was retested with the computer-based multimeter (Figure 3) after determining that the building was bonded to the substation. The site’s grounding system diagonal now measured 2,500 feet. For a proper FoP, the current return probe had to be a minimum of 12,500 feet (almost 2.4 miles) away—not 300 feet. Using the computer-based multimeter, the distance was reduced to 5,000 feet, which was still a bit of a hike.

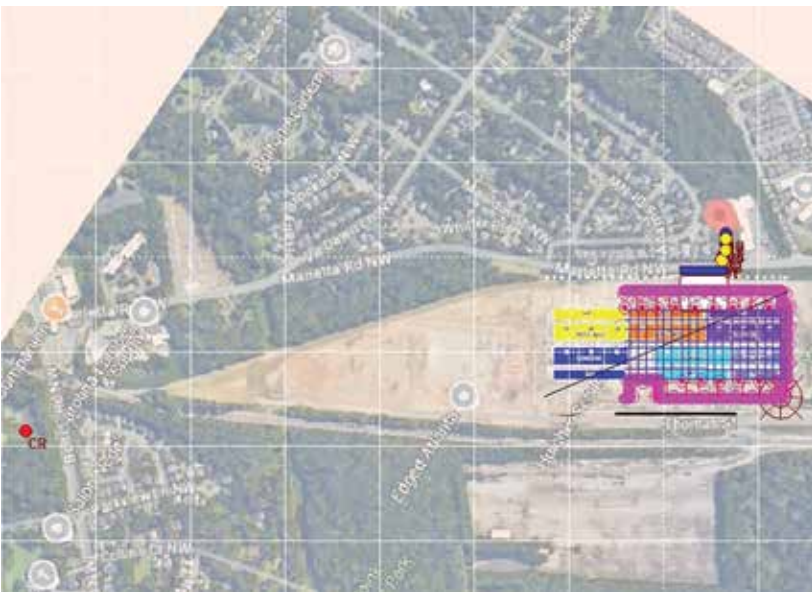
**Note:** Even using a computer-based multimeter, testing errors and bad data are still possible if you fail to go far enough away from the site under test. Always confirm the site’s isolation and diagonal before testing, regardless of the chosen test method.

**EXAMPLE 3: DATA CENTER BUILDING, GEORGIA**

This new data center building on a campus was tested with the computer-based multimeter. The building was allegedly isolated, but we successfully conducted a test and obtained good data (Figure 4).

**KEY TAKEAWAYS**

The FoP test is still specified as part of start-up and commissioning testing for many sites. You must understand the requirements of this test



**Figure 3:** Data Center Building, Georgia, Using Computer-Based Multimeter



**Figure 4:** Data Center Building, Georgia, Using Computer-Based Multimeter

to determine whether the FoP test method can be successfully performed. The criteria include:

- De-energization and isolation must be confirmed on site with a continuity test.
- Locate the current-return probe a minimum of five times the diagonal distance of the site. The larger the site, the farther you must go—up to 10 times the diagonal distance at very large sites.
- Measure every 10% of the distance to develop a full test graph to find the true resistance value. Testing at 62% will rarely be successful, especially at a large site like a data center.

## CONCLUSION

If these conditions can't be met, an alternative test method, such as using a computer-based multimeter, is required for a successful test. Whatever the test method, testing personnel need extensive experience in grounding testing, substantive knowledge of IEEE Std. 81, and appropriate test equipment and training to perform a proper test and obtain valid data. [NW](#)



**Lee Howard** is a senior grounding specialist with Hood Patterson & Dewar, Inc. With more than 25 years of experience, Howard specializes in the design and analysis of grounding, lightning protection, and surge suppression systems. He speaks at various industry conferences and offers grounding testing and consulting services to a wide range of domestic and international clients, including electrical utility, industrial, and commercial sites. Howard holds two patents in grounding and lightning protection products. He earned a BS in electronics engineering technology at DeVry University and a Power Systems Certificate from the Georgia Institute of Technology.



**Jacob Rioux** is a Grounding Specialist at Hood Patterson & Dewar, Inc. With a background in substation design and testing, Rioux provides substation and facility grounding system testing and safety analysis. He also performs soil resistivity testing and grounding system design for new construction. His client base includes electric utilities and industrial and commercial facilities. He provides grounding articles, training, and presentations for conferences and clients nationwide. Rioux has a BS in mechanical engineering technology with a minor in electrical engineering technology from the University of Maine.

# CREATE A WINNING CULTURE

BY BRIAN RODGERS, *AMP Quality Energy Services*

In today's tight labor market, retaining top talent is a challenge, especially as some firms race to the top with salary offerings. The data center market expansion and the onshoring of our country's manufacturing base have created unprecedented demand. Project timelines continue to compress, requiring more man-hours in a shorter duration of time to complete work that just a few short years ago would have taken three to four times as long. This compression requires more of the already-taxed resource pool.

This is great news for NETA technicians and those wanting to enter this career path. There has never been a better time to be in this industry. But money alone doesn't drive or satisfy most employees, and there is always someone willing to pay more. Replacing an employee can cost 80–100% of their annual salary, eroding your company's bottom line. So, how do you retain and attract the best while unlocking your team's potential? It starts with culture!

## FIND A PURPOSE

People want to know that their work contributes to something greater—that the time they spend on the job connects to something more than profits. How are those profits used? Is the company giving back to the community in a meaningful way? Even

the largest employers in the NETA space are small compared to the consumer brands that catch the eye of the common household. How can we stand out as a non-consumer-facing brand? Obviously, we cannot compete with the marketing budgets of the huge consumer brands, so we must concentrate our efforts where they matter most: in the communities where our technicians live and play.

Very little builds loyalty like hearing from someone you just met that they love how helpful your employer is to the community. I know it cheers me to hear “Oh yeah, I know AMP. They donated to an organization I serve.” Or “They are really engaged in the community.” Our technicians like to hear that the profits from the work they perform are being used as a force for good in their communities.



*Testing is important and potentially hazardous work.*

Connect your employees' daily efforts to a larger purpose. In the electrical testing industry, their work saves lives, creates safer environments, and reduces costs for consumers. This isn't an exaggeration—it's the truth. We need to make sure we frequently remind those in our organizations that what they do matters.

Over the past few years, NFPA has included equipment maintenance in NFPA 70E, and NFPA 70B has been adopted as a standard instead of just a recommended practice. This indicates a shift in the industrial world of recognition and the inclusion of maintenance into the cost of goods—not just something that is done when we have extra capital. It removes

maintenance from the bucket of expenses that can contract or diminish when the company is in a tight spot. Instead, maintenance becomes a requirement to meet requirements. Herald these changes to your employees. Spotlight them so your frontline workers and support staff connect the jobs they perform to the overall safety of the industrial machine!

### **BUILD A MISSION, VISION, AND CORE VALUES**

To inspire your team, make your organization's mission, vision, and core values the heartbeat of every decision and action. Many leadership writers say this is the first place to start moving a company's

## COVER STORY

culture. I recognize that not everyone has the decision-making responsibility to create or change the mission, vision, or core values. We all, however, can share and promote the ones we do have.

Make sure your mission is something your team can get behind and be inspired by. The company vision should be BHAG: a big, hairy, and audacious goal—something that when achieved will make a real difference in the world or at least the area of the world where your organization operates. Lead all major decisions by reviewing your vision, mission, and core values.

At AMP, our mission outlines our desire for what we believe to be beneficial to the whole world: “To further the Gospel while sustaining exceptional employment, providing quality services to the energy industry.” The shorthand version is God, Employees, Clients. We believe that if we prioritize them in that order, we will provide the best service within our capabilities. Your vision and mission

statements can be anything you feel can inspire and create unity.

We can even define mission statements and core values for subcultures in our organization. Several of our lead technicians have created their own team mottos. They were not in opposition to the whole, but in support of it. We see this often in military units that still belong to their service division, but they have their own logo or insignia and motto that connects them to one another and brings brotherhood.

If you find yourself within a larger organization, rally your team and come up with something together that each of you can get behind. Spend a few bucks and put it on some t-shirts, but even more important, make sure your work each day reflects the principles that you agreed are important. Even if your statements aren't perfect, unity around a shared purpose is better than scattered efforts. Involve your team in refining these statements to foster ownership and alignment.



*The entire team participated in the ribbon-cutting for our new building.*



*Empowering employees builds trust.*

## **BUILD TRUST THROUGH COMMUNICATION**

A winning culture hinges on trust. Trust enables vulnerable communication, which drives collaboration and mutual benefit for all—not just shareholders. But how do you build trust in a skeptical or jaded team? It starts with care. Show employees their goals matter to you. Support them with training and education that allows them to continue their careers and supports their personal life goals. You will not know their personal life goals unless you engage with them at all levels, empower them, and train your management team and front-line supervisors to do the same.

Showing how much we care ultimately builds trust in our teams. Trust enables vulnerable communication. Vulnerable communication drives collaboration. We will not get to know the personal issues we need to respond to without first being vulnerable and providing a safe place for our team members to be vulnerable.

Vulnerable communication isn't without risks, but avoiding it guarantees stagnation. We all know how demanding this industry can be on

your time. Craft a collaborative environment where technicians can speak freely when they have demands outside of work. Don't expect them to respond to that 2:00 AM call unless we are willing to provide time for them to attend that 10:00 AM dance recital. Flexibility and collaboration are key to the give and take that is required to run a successful business.

## **PROVIDE TRAINING**

Training and development must encompass more than just the technical aspects of the work. We must provide paths of upward movement within our companies, or they will be more inclined to listen to the often-false advertisements of recruiters from other companies. Of note here: If you are a technician, the whole industry needs techs, so it often feels like the burden to accomplish the increased workload falls directly on frontline personnel. The grass is not greener in many places; the whole industry is at a deficit for technicians.

I highlight leadership training early on, as it can sometimes be overlooked. We all provide safety and technical training, but do we do it as well as we could? Even in my own organization, we are always looking for ways to improve the technical and safety training we provide. As one COO



*Training must be a top priority.*

wisely said, “What if we train our people, and they leave? What if we don’t, and they stay?”

As younger technicians enter the workforce, the opportunity to provide life skills, investment, money, and time management training will become evident. The skillset that young people bring with them to the workforce seems to be diminishing every year, or maybe I just can’t remember how dumb I was 25 years ago. Our educational system and the homelife culture most of our employees come from do not inherently include basic life skills. Incorporating those into our workforce development programs will go a long way toward creating loyalty and trust.

Recruiters will tell your employees whatever they think they want to hear. They benefit greatly from the transaction when you move from one company to the next, and recruiting is one place in our industry where margins continue to grow. Encourage your employees to be smart. Don’t just take their word for anything; demand that they allow you to speak with frontline technicians in the organization who will be truthful about the work environment you will experience once you jump ship. I have heard from many technicians who have gone from one company to another about how the issues

were mostly the same or worse. They just had a different logo on their hat.

## **MAKE THINGS RIGHT**

I believe that most NETA companies have a strong desire to perform high-quality work and do right by their people. Our organizations are all made up of humans, and humans inherently are faulty. We all make mistakes, so sometimes we experience those faults personally. These injustices are real and can impact our decision to stay with an employer or not. Just know that it is often easier to work through those issues than to run from them.

This leads me to my next point: It is not if, but when, we fail as an organization. We will let our people down; we will make decisions they do not agree with, and we may even emotionally hurt someone with our actions and words. When we do, our response and reaction to our own words and actions may be the most important part of our culture.

Our COO often says it is not your action but your re-action that counts the most. Humility and a willingness to make things right go a long way in saying you care about your employees. When we have been out of line or have not visibly represented our core values, it is important

to ask forgiveness. Some of the most impactful moments I had with one of our employees were when I became angry and reacted in a way that was not suitable to the situation or a professional environment. Going back to that employee and soliciting forgiveness was incredibly powerful. It connected us in a way that had not seemed possible just moments before.

Be sure to stay humble, take time to read the situation and the person's emotional indicators. Some of us are gruff and abrasive, and we may have a harder time noticing when we have done damage with our words. We tend to be focused on the physical work, so our workers are not likely to come to us and reveal that we hurt their feelings. If they did, would we take the opportunity to support that, or would we dismiss it as if they needed to toughen up?

Construction mental health costs are significant, driven by high stress, long hours, job insecurity, and physical demands. These issues lead to workforce shortages and impact productivity. Support your employees' mental health. Unaddressed mental health issues can cost companies \$15,000 per employee annually, not to mention the high cost of turnover. Suicide rates in the construction industry are second only to mining.

It is appropriate to point out that we have a significant number of veterans in our industry, and most would argue that they make some of the best technicians. Veterans from the 249th Battalion are particularly in high demand. But veteran suicide rates are nearly double that of non-veterans. We have had many successful veterans in our business through the years. We love those guys dearly. We also need to keep in mind that they can be dealing with things non-veterans cannot even imagine. Coordinate closely with HR and make sure to help connect them with any resources that may benefit them, and allow them schedule flexibility to meet with doctors and counselors.

## CONCLUSION

Ultimately, we all want a team that provides excellent results for the customer, in a safe

manner, while providing financially for the team's family and stakeholders. Vulnerable communication, connecting their work with what matters, and building trust through investing in their lives brings about collaboration and mutual benefit for all. Without trust, success is fleeting. Invest in care, communication, and a purpose-driven culture to retain talent, boost performance, and build a team that thrives. [NW](#)



*Brian Rodgers is the founder and CEO of AMP Quality Energy Services. He has been involved in NETA committees for 25 years and is a NETA Level 4 Senior Technician. Rodgers lives on Freedom Farm in Somerville, Alabama, with his lovely wife and ten of their eleven children. Their oldest daughter is married to Zechariah Freeborn (also a NETA Technician), and they have two small boys. One of Brian's greatest joys is spending time on the farm with his grandsons.*

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# RETHINKING JOB BRIEFINGS IN THE ELECTRICAL POWER INDUSTRY

BY SETH VINCENT, *TRC Companies*

Every day, thousands of electrical workers across the country begin their day with a job briefing. In theory, these briefings represent a critical safety checkpoint, a moment for crews to pause, assess hazards, and plan their work before beginning hazardous tasks. In practice, many job briefings have become something far less valuable: a paperwork exercise.

The evolution of job briefings from genuine safety discussions to compliance-driven documentation did not happen overnight. It resulted from well-intentioned efforts to standardize safety practices and the natural human tendency to equate more process with more protection. The result is a system where completing forms has become synonymous with safety.

## A TALE OF TWO JOBSITES

Imagine yourself as a supervisor observing crews at two job sites:

### Site A

The site lead spends 20 minutes in their truck filling out the form. The documentation is beautiful: detailed, legible, nothing missed, with a thorough hazard analysis written out. Upon completion, they exit the truck and walk around, handing people the clipboard. Each person glances at the pages, signs, and hands it back. Getting signatures takes about

five minutes. Total time spent on the pre-job briefing: 25 minutes.

### Site B

The site lead reads through the form and fills it out quickly, taking about three minutes. The form is messy: margin notes, circled items, and a sparse hazards section. After completing the form, the site lead spends two minutes gathering everyone together. As a group, they spend the next 10 minutes talking through the work, discussing hazards, reviewing what happened yesterday, and making agreements about communication throughout the day. They sign quickly at the end. Total time spent on the pre-job briefing: 15 minutes.

Which scenario would you rather see?

Most field workers and safety professionals, when presented with this choice, prefer Site B. Yet when we examine our own organizations honestly, we often find that Site A is far more common.



### The Investigation Incentive

Now consider what happens if an incident occurs at each site. When a post-incident investigation begins, one of the first things they ask for is a copy of the job briefing. Which form looks better in the investigation file?

- Site A creates a paper shield for the *file*.
- Site B creates a physical shield for the *field*.

We have incentivized the wrong one.

### WHAT IS A JOB BRIEFING?

Before examining what is wrong with current practices, we first must understand what job briefings are and what the regulations specifically require.

Regulatory requirements from OSHA (29 CFR 1910.269 and 1926 Subpart V) and industry standards like NFPA 70E establish job briefings as a fundamental safety practice. Interestingly, OSHA does not explicitly define

Job Briefing in the Definitions section of 29 CFR 1910.269(x). Instead, the standard defines a job briefing by its required content and method. The regulation specifies five mandatory subjects:

1. Hazards associated with the job
2. Work procedures involved
3. Special precautions
4. Energy-source controls
5. Personal protective equipment requirements

Notice what is absent from the requirements: **forms**. The regulations focus on shared understanding, not paperwork.

OSHA's Electric Power Generation, Transmission, and Distribution eTool further clarifies this:

*Keeping a written record of job briefings is not specifically covered by the standard, but it is a best practice to do so.*

## **Planning vs. Briefing: A Critical Distinction**

The planning requirement under 29 CFR 1910.269(a)(4) says that existing characteristics and conditions related to the safety of the work must be determined before work starts. Many organizations also adopt NFPA 70E planning guidance.

The briefing requirement, on the other hand, has no OSHA mandate to be written or signed. This distinction is deliberate. The regulation prioritizes verbal exchange over the creation of a record.

Many organizations drive compliance using a single form that combines a safety plan with a briefing signoff. This approach can work well, as long as you actually have the conversation. The problem arises when we sign the plan and call it a briefing. Signing a plan you have not discussed is not a briefing.

## **Evidence Shows Briefings Work**

Before addressing what is broken, it is worth establishing that effective briefings genuinely improve safety outcomes.

Consider the investment first. Based on approximately 500,000 U.S. electric power generation, transmission, and distribution workers (BLS Utilities Sector NAICS 22, 2025), spending an average of 20 minutes per day on briefings across 250 workdays per year, the industry invests roughly 42 million labor hours annually on job briefings.

The evidence supports that investment. The Associated Builders and Contractors (ABC) STEP Safety Management System, analyzing over one billion work hours, found that organizations with daily safety discussions experience 78% fewer incidents. Research by Urbint and the Construction Safety Research Alliance found that 50% of serious incidents had identifiable deficiencies in job briefings, and Gallup's workplace safety research shows 64% fewer incidents among engaged workers compared to disengaged ones.

We are already investing the time. The question is whether we are investing it well.

## **THE DOCUMENTATION TRAP**

The most pervasive issue affecting job briefings today is what we call the "checkbox mentality." This occurs when the act of completing a form becomes the primary focus, rather than the safety discussion the form was designed to facilitate.

The symptoms are familiar to anyone who has spent time in the field. Crew leaders complete briefing forms quickly, copying hazards from previous briefings without site-specific analysis. Forms get passed around for signatures with minimal verbal discussion. The same hazards are identified regardless of actual site conditions. The focus becomes obtaining required signatures rather than ensuring comprehension.

Checklists themselves are valuable tools. They prompt the leader to consider a comprehensive range of hazards. But when the form is passed around silently, signers see only what was checked, not what was considered. The leader may have thoughtfully evaluated and rejected certain hazards, but the crew does not benefit from that evaluation. A discussion can surface those judgment calls and allow others to challenge them. Without that exchange, the checklist's value stays locked in one person's head.

## **THE MEASUREMENT CONFLICT**

A related issue is how organizations measure briefing effectiveness. We typically measure whether the form was completed, whether all fields were filled in, and whether everyone signed. What we should be measuring is whether an exchange of information happened, whether the right site-specific hazards were identified, and whether workers understood those hazards. We measure form completion because forms are easy to audit. Conversations and comprehension are not.

With that said, genuine engagement does leave visible signs. In an effective briefing, participants speak too, even if briefly. The leader asks something like, "What is different

today?” and the crew identifies at least one site-specific change. The crew states a clear stop-work trigger, such as a change in plans, unexpected conditions, or new personnel arriving on site. These are observable but not from a signature line.

## SPECIAL SITUATIONS

A particularly challenging aspect of job briefing practices involves workers and situations where standard briefing forms are less effective. Not every job fits the same mold, yet we often force every situation through identical documentation requirements.

### Lone Workers

Many organizations require lone workers to complete the same briefing forms as crews, resulting in an individual filling out paperwork in isolation. Job briefings derive much of their value from the interaction between crew members. A person writing down hazards alone does not get that benefit.

OSHA’s regulation explicitly addresses this situation in 29 CFR 1910.269(c)(5):

*An employee working alone need not conduct a job briefing. However, the employer shall ensure that the tasks to be performed are planned as if a briefing were required.*

Rather than forcing lone workers through the same documentation exercise as crews, organizations should look for ways to restore the interactive element. A briefing with a supervisor, dispatcher, or peer over the phone once on-site can give the lone worker another perspective without extensive documentation. Where documentation is still needed, it should steer the lone worker into the same kind of hazard analysis that happens naturally in a group briefing.

### Repetitive Jobsites

Another significant challenge arises when crews perform similar work at the same location day after day. Crews become so familiar with the site and tasks that briefings feel redundant.

Teams begin to hear briefings consisting of “we talked about this yesterday,” or “same job, same hazards,” or “everyone knows what we are doing.”

This complacency is precisely when briefings matter most. Familiarity breeds assumptions, and assumptions lead to incidents. That does not mean every briefing at a familiar site needs to be a 30-minute production. OSHA recognizes this in 29 CFR 1910.269(c)(4):

*A brief discussion is satisfactory if the work involved is routine and if the employees, by virtue of training and experience, can reasonably be expected to recognize and avoid the hazards involved in the job.*

The standard asks for a discussion scaled to the work. At repetitive sites, that discussion can be brief, but it still must happen.

The key to keeping briefings effective at repetitive sites is focusing on what has changed rather than rehashing the familiar. Even at a site the crew has been at for weeks, something is different every day: weather, crew composition, adjacent activities, equipment condition, and personal factors. Rotating who leads the briefing brings fresh perspectives and prevents the tired script that develops when the same person always runs it. Varying the questions matters too. “What could go wrong today?” generates different responses than “What are the hazards?” Value is easily mined from recent incidents, which remind crews that the hazards they work around every day are still present.

## THE DIGITALIZATION TRAP

Many organizations have embraced digital tools for job briefings, replacing paper forms with tablets and apps. While digital solutions offer genuine advantages, they often perpetuate existing problems rather than solving them.

Digital briefing tools are frequently marketed with promises of streamlined processes, reduced paperwork burden, better data collection, and improved compliance tracking. In practice, many digital implementations simply transfer

paper forms to screens, maintaining all the problems of the checkbox mentality while adding new ones.

Perhaps most importantly, when compliance becomes easy to measure through digital dashboards, it can become the only thing anyone measures. Technology can make the measurement problem worse, not better.

## FINITE RESOURCES

The pre-job briefing may be the only purely safety-focused task of the entire workday. How much of that time should be spent on the form?

On-site teams have a time budget—the minutes available before work starts—and a cognitive load budget—the mental energy available for thinking. A complex form does not just take time; it takes focus. A site lead who has spent 20 minutes working through a dense checklist has less mental energy left to actually think about what could go wrong today. When the form consumes both budgets, nothing remains for actual hazard analysis.

The goal should be to give workers tools that help them internalize hazard analysis without spending all their capacity on writing. Less burden on documentation creates more capacity for thinking. Preparing the brief should feel like preparing for the work, not a separate administrative task.

If workers are slogging through the form, they are not thinking about the hazards.

## CONVERSATION OVER COMPLIANCE

The fundamental shift our industry needs is moving from “review the form” to “discuss the work.” The form should guide the discussion, not replace it.

### Tools That Support the Conversation

The right tools support the conversation rather than replacing it. Helpful tools such as task hazard analysis primers can give crews a starting point with common hazards already identified

and lessons learned built in. Digital tools work best when they prompt discussion rather than merely capture data, and when they reduce documentation burden rather than increase it.

Organizations should also look for ways to verify that a real conversation occurred, not just that a form was signed. The underlying goal has always been two things: covering the right topics and making sure everyone on the crew understands them. Whatever method an organization chooses, it should capture evidence of both.

### Let the Form Evolve

Finally, the form itself should evolve. If a prompt gets the same checkmark every single day, question whether it is adding value or just adding steps. If the people filling out the form have no seat at the table when it is designed, that is a problem. Consider approaches that allow rapid iteration and give field workers a voice in shaping the tools they use. The people doing the work know what works. Ask them.

## CONCLUSION

The path forward requires courage: courage to simplify documentation, to trust the people leading the briefings, and to invest precious pre-job time in safety rather than compliance. Crews that truly discuss hazards and plan their work are better prepared than those who dutifully complete extensive forms.

The intent was safety. The outcome was paperwork. We as an industry invest valuable time in this process because we know it can work. Let's make it actually work for the field. [NW](#)

## REFERENCES

OSHA. OSHA 29 CFR 1910.269, *Electric Power Generation, Transmission, and Distribution*, Subpart R (c) Job Briefing.

OSHA. OSHA 29 CFR 1926.952, *Safety and Health Regulations for Construction*, Subpart V Job Briefing.

NFPA. NFPA 70E–2024®, *Standard for Electrical Safety in the Workplace*®.

OSHA. OSHA Electric Power Generation, Transmission, and Distribution eTool, Hazard Assessment and Job Briefing.

Associated Builders and Contractors (ABC). STEP Safety Management System Self-Assessment.

Associated Builders and Contractors (ABC). ABC Construction Safety Report: Jobsites Can Be Nearly 7 Times Safer with Health and Safety Best Practices, May 1, 2025.

Urbint Is Now Itron. Blog: "What Makes an Effective Job Safety Briefing?"

Construction Safety Research Alliance (CSRA). *Unique Precursors of Serious Injuries and Fatalities.*

Gallup. State of the Global Workplace 2025.

U.S. Bureau of Labor Statistics. Utilities Sector Employment Data (NAICS 22).



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# PASSING THE NETA EXAM: TRAIN, DON'T CRAM

BY MOSE RAMIEH, *CBS Field Services*

I sat down for my NETA Level 4 exam and immediately realized I was in trouble. The first question, I didn't know the answer. The second, totally clueless. After working through nearly twenty questions, I finally found one I could confidently answer. That is not a great feeling when you are supposed to be operating at the highest level in your field.

## A DIFFERENT KIND OF TEST

I had more than ten years of experience. I had been in the field, performed the tests, and built a level of confidence that I thought would carry me through. It almost did not. I was able to recover and pass, but it exposed something I've seen repeatedly since that day: The NETA exam doesn't evaluate what you do every day. It evaluates how well you understand it.

## What the NETA Exam Really Is

One of the biggest mistakes technicians make is assuming the exam will reflect their daily work. It doesn't. The exam is built around the entire discipline of electrical testing. It is not based on your company's scope or your personal experience. If it is in the Detailed Content Outline (DCO) of the NETA exam preparation materials, it is fair game.

You'll be tested on things you do not perform regularly. You will be tested on apparatus you have not touched in years, or ever (e.g., network protectors)! And you will need to apply electrical power system knowledge and testing skills.

This is not a memorization exercise. It is validation that you understand how electrical testing works across a broad range of equipment and situations. It is designed to confirm that you understand the appropriate amount of "why" behind the work, not just the "how."

## WHY GOOD TECHNICIANS STRUGGLE

The technicians who struggle the most are often the ones you would expect to pass. They have years of experience, they know common power system equipment, and they perform their work well. And that's exactly the problem; they rely too heavily on experience and underestimate the difficulty presented by proper preparation.

In the field, experience allows you to be efficient and move on to the next device or project. The exam requires you to peel back the anticipation of passing or failing results and explain them. The exam does not measure what you have done repeatedly. It measures your depth of understanding across the entire electrical discipline. Any shallow areas show up quickly when a question is presented in a way that requires explanation instead of recognition.



PHOTO: © ISTOCKPHOTO.COM/PORTFOLIO/DIKUSHIN

There is a difference between becoming more experienced and becoming better. Experience builds familiarity. Improvement requires effort, curiosity, and a willingness to move beyond what you already know. The exam makes that difference obvious and separates those who pass from those who don't.

## WHERE THE GAPS SHOW UP

Most technicians do not fail because they lack intelligence or a work ethic. We all know that guy who is the go-to individual to get a project done. However, they may struggle because of gaps they do not know they have.

Let's get tactical here and point out the biggest gaps technicians are unprepared for.

## Safety

It's the classic complaint from every technician who didn't pass the exam: "I only missed it by a couple of questions." When they get the full breakdown of the results, it shows that they did not get **100%** on safety-related questions. Table 1 shows average performance results across content areas on actual exams.

This points out an opportunity: The industry focuses tirelessly on safety, and you must be prepared to nail all the safety questions! While we talk about safety almost every day on the job, there are specific things we must review before the exam:

- PPE use and limitations (e.g., insulated gloves, hard hats)

**Table 1:** *Average Performance Results Across Domains*

Domain	Percent of Exam Questions	Percent of Correct Answers
Safety	15%	75%
Electrical Testing Fundamentals and Theory	35%	83%
Component Testing	55%	78%
Systems and Commissioning	5%	100%

- Procedures and requirements related to lockout/tagout
- OSHA and NFPA 70E standards and their requirements

## Math

Math skills are the most common problem area, not because technicians have never seen the required math, but because they do not use it every day. Without use, any skill becomes rusty, and math is no exception. Be honest; when was the last time you added resistors in a series-parallel circuit to create the equivalent circuit and then calculated the current flow? Or had to calculate the power factor of a power system, knowing only the KW and an angle of 22 degrees?

The assumption that can creep into your math skills is that you know it well enough to get through the problems. However, on a two-hour, 100-question exam, you have 1.2 minutes per question. Any delays or uncertainty will cost you valuable time.

This means that if you aren't proficient in the necessary math skills, a simple problem becomes a time suck. The exam writers are challenged to provide great distractors (the wrong answer) from the correct answer on the exam. This means that if there is a common math mistake, like forgetting to use the square root of 3 in your calculations, the exact answer you calculated will be on the test, but it will be wrong. This potentially leads you to think you have the correct answer and move on to the next question.

The internet, modern test equipment, and now AI have changed the way we work with math. With your phone in your hand, you are a second away from the answer to the most advanced math calculations ever imagined in our industry. You enter a transformer's nameplate data, and the test set (or the internet) provides you with the turns ratio, or the pass/fail results on a winding resistance test. These routine calculations, now done by the apparatus or the internet, become your Achilles heel during the exam when all you have is a formula sheet and a TI calculator.

If you have not practiced these calculations with the calculator you'll use on the exam, which can be found on the NETA exam preparation website, you'll hesitate. You may know the process, but you aren't confident in the execution. That hesitation costs time. It is one thing to understand a concept; it's another to apply it quickly and accurately under pressure.

## Unfamiliar Electrical Apparatus

Another common gap is exposure to the wide variety of apparatus in our industry. If your company does not work on certain equipment, you will not see it in the field. Motors, relays, network protectors, and other system components can become blind spots.

The DCO provides a comprehensive list of the equipment you must be familiar with, as it will show up on the exam. Here are a few of the areas you must study:

- **Medium-voltage cables.** It's important to ensure you understand the construction of a medium-voltage cable and how each layer plays a role in completing a medium-voltage cable system.
- **Network protectors.** It's uncommon for a technician to ever see one of these.
- **Motors and other rotating machinery.** Some people work on motors all the time; others do it rarely. They're common, so you must learn a lot more about them than you currently do.
- **Fiber optics.** Another example of something we don't often test.
- **Fuses.** They're everywhere, but do we know enough about them to pass the exam?

## Electrical Standards

Another issue is surface-level understanding of codes and standards. Studying the NETA standards is necessary, but it is not enough. The NETA standards are built on a foundation of other industry standards, and understanding those references is what separates familiarity from true competence.

Passing the exam and being an articulate technician in front of a customer requires more than recognizing procedures. It requires the ability to interpret results, apply concepts, and understand the intent behind the tests. Knowing what the NETA standards say is not enough. You must understand where those requirements come from and what they mean in practice.

The NETA standards are not written in isolation. They reference a wide range of industry standards that provide the technical depth behind the testing requirements. If you want to go beyond surface-level understanding, you must become more familiar with these more common references.

Key examples where technicians can benefit from going deeper include:

- **Ground Fault Systems and Protection – NEC (NFPA 70).** An important standard that governs how new systems are installed. Ground fault protection systems are one of the more common questions you might find on the exam.
- **Insulation Testing and Dielectric Analysis – IEEE 43 and IEEE 400 Series.** Insulation resistance testing, polarization index, and VLF cable testing are all rooted in IEEE guidance.
- **Circuit Breaker and Protective Device Testing – IEEE C37 Series.** Testing circuit breakers and protective devices relies heavily on IEEE standards for performance expectations, timing, and interpretation of results.
- **Transformer Testing and Diagnostics – IEEE C57 Series.** Transformer testing, including turns ratio, insulation, and diagnostic testing, is supported by IEEE standards.
- **Electrical Safety – NFPA 70E and OSHA.** Safety is not just a checklist. It is a framework for how work is performed.

## WHAT PREPARATION ACTUALLY LOOKS LIKE

Preparation for the NETA exam does not happen in a single study session. It happens

over time, and it requires intention. Doing it well has two parts.

### Studying

The first is studying (outside of work hours). You must set aside time for it. That means weeks, and in many cases months, ahead of the exam. Short (30–45 minutes) consistent sessions are far more effective than trying to study in large blocks. Cramming information into a few days does not work.

Taking a topic from the Detailed Content Outline and spending time reading, watching videos, and working through the concepts builds a level of understanding that cannot be rushed. Pro-tip: If you can envision the amount of time you believe it will take to prepare for the exam, double it.

### On-the-Job Training

On-the-job training, happens in the field, and this is where many technicians miss an opportunity. The job itself is a training environment if you treat it that way. It is easy to focus on completing the work, but the technicians who improve are those who go further. They research why a test is being performed, what the expected results should be, and what those results actually mean.

Working in the field also allows you to experiment and learn in ways you cannot replicate in a classroom. You can take the time to understand how the test equipment produces its results. You can run a test a different way, within reason, and observe how it impacts the outcome. You can compare expected values to actual results and begin to understand where those numbers come from. That kind of hands-on learning builds confidence and depth that studying alone cannot provide.

### Unfamiliar Equipment

Preparation also requires stepping outside your normal scope. If you primarily work on one type of equipment (maybe you're the transformer guy), you need to make an effort to learn the testing requirements for other equipment. That may involve volunteering for

different work scopes, observing how other technicians perform testing on apparatus you don't normally test. Spend time reviewing the construction and operation of unfamiliar apparatus. The exam does not adjust to your experience; you must expand yourself.

## Practice

Once you identify your weak areas, the work becomes more focused. Practice exams are one of the most effective tools. They highlight where you struggle and how questions are structured, but they only point out the gaps. The real value comes from going back, working through those areas, and building a deeper understanding of the content.

A recent review by NETA found that technicians who completed the practice exam prior to taking the proctored test achieved a 33% higher pass rate than those who did not. While the practice exam is not intended to mirror the exact questions on the proctored test, it covers a broad range of topics and sample questions designed to highlight knowledge gaps and reinforce effective test-taking strategies.

## Fundamentals

Building the fundamentals is critical. You must be comfortable with electrical theory, basic formulas, and interpreting electrical drawings and protective curves. Practicing by writing things down, working through equations, and drawing circuits reinforces understanding.

Working with others can also make a significant difference. Study partners, mentors, and peer discussions expose gaps, challenge your thinking, and create accountability. Many technicians do not fail because they are not capable. They fail because they do not stay consistent, and this is where an accountability partner(s) can deliver amazing results.

## HOW TO TAKE THE EXAM

Preparation gets you ready, but exam strategy determines how effectively you perform on exam day.

**Keep moving.** One important thing to remember is to keep moving forward. On a

100-question exam, the first pass should take no more than 20 to 30 minutes. This is not the time to solve every problem. It is the time to secure the points you already know. This was the strategy I utilized during the NETA 4 exam I passed.

**Answer what you know first.** A structured approach works best. On the first pass, answer the questions you know immediately. On the second pass, return to the questions that require some effort. On the third pass, work through the most difficult problems, eliminate the obviously wrong answers, and make your best guesses. Be aware of distractor answers. The exam is not designed to trick you, but it does include plausible incorrect answers. Read all the answers thoroughly before choosing the best answer.

**Break it down.** Writing things down and breaking problems into steps is critical. Do not rely on mental calculations; use the calculator. Write equations, sketch circuits, and work through the problem. This reduces errors and allows you to verify your work.

## TWO PATHS AFTER THE EXAM

Passing the exam brings a sense of relief and excitement. It confirms that the time and effort you invested paid off. It also reinforces your credibility, builds confidence, and creates opportunities for career advancement. In many cases, it leads to increased compensation and industry recognition.

Failing is a different experience. It is frustrating, especially for technicians who believe they were prepared. From there, the response can go in two directions.

Some technicians take it as an experience to be learned from and an opportunity to improve. They use the exam experience to go deeper and more accurately identify their gaps. They learn areas where they must rebuild skills they have not used and push themselves outside of their comfort zone.

Others take a different path. They might double down on the fact that they don't need to

pass the exam to be successful in this industry. In some ways, they're right, but in other ways, they are doing themselves a disservice. They convince themselves that it is enough to build on their years of service.

### FINAL THOUGHTS

There is no secret or silver bullet to passing any NETA certification exam; the process is straightforward:

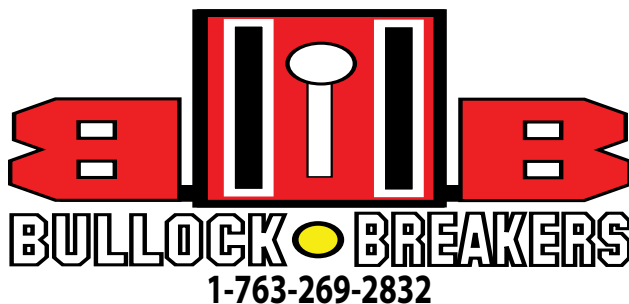
- Follow the Detailed Content Outline (DCO).
- Use practice exams to identify weaknesses in the four domains:
  - Safety
  - Electrical tests and fundamentals in theory
  - Component testing
  - Systems and commissioning
  - Bonus Area: Test-taking techniques

- Spend time on the areas you don't fully understand. Remember that it will take more time than you think (twice as long) to become proficient.

It is simple; it's just not easy. If there is one thing to remember, it's this: You don't have to figure it all out on your own, but you must put in the work. No one else can do that for you. [NW](#)



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# THE NEW BUSINESS MODEL AND THE OLD DELIVERY PLAYBOOK

BY MORTEZA TALEBI, *PowerX*

The energy sector has entered an era defined by speed, scale, and continuous delivery. Data centers, renewables, and grid modernization programs demand faster project cycles and higher utilization of field resources. In response, business models have shifted toward volume-driven delivery, aggressive schedules, and increasingly distributed responsibility.

However, many project management practices—particularly those governing field execution—remain rooted in legacy delivery models built for slower, more linear work. This article examines how that misalignment reshapes project execution, why traditional responses often fall short, and what structural realignment requires.

## WHEN THE OLD MODEL FIT THE SYSTEM

A decade ago, the business model supporting energy-sector field projects was built around predictability. Project timelines were measured in years, not quarters. Engineering, construction, testing, and commissioning followed largely sequential paths, and project



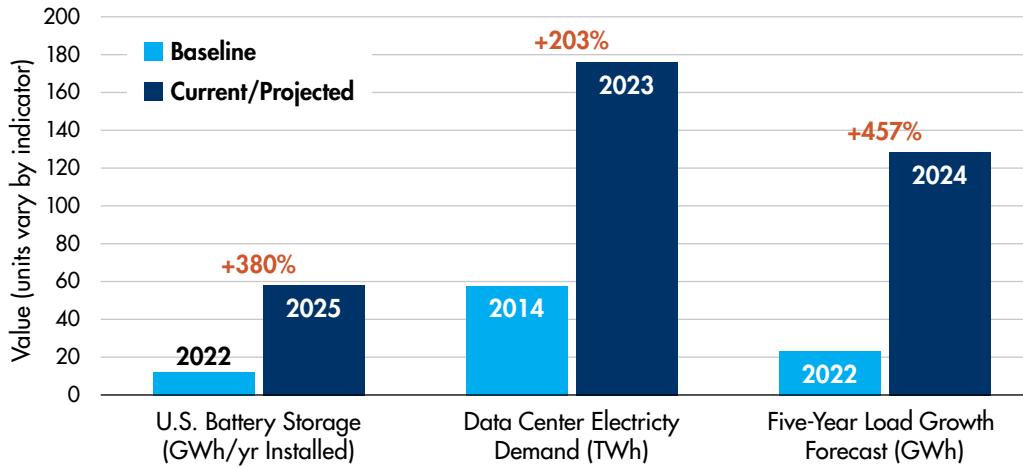
management focused on coordination rather than compression. Field execution depended on experienced technical leaders, and decision authority lived close to the work. That model was imperfect, but it was internally consistent.

Today, that alignment no longer exists. The U.S. Energy Information Administration forecasts the strongest four-year growth in electricity demand since 2007, projecting a 3% increase in 2027 alone. The U.S. DOE reported that data center electricity consumption tripled from 58 TWh in 2014 to 176 TWh in 2023 and is projected to reach 325 to 580 TWh by 2028. According to SEIA, the U.S. energy storage industry installed a record 57.6 GWh of new capacity in 2025—nearly five times the 12 GWh installed in 2022. Grid Strategies reports

that the five-year load growth forecast increased nearly fivefold in just two years—from 23 GW to 128 GW. Business models adapted: Project portfolios expanded, delivery became more fragmented and parallel, and success became defined by throughput rather than the slower maturation of systems.

At the same time, generational turnover and persistent workforce shortages reinforced this shift. The Center for Energy Workforce Development (CEWD) reports that 40% of the utility workforce is or will be retirement-eligible by 2030, while 76% of energy and utilities employers are experiencing a talent and skills gap. What did not evolve at the same pace was how projects are managed at the point of execution.

# FEATURE



**40%**  
of the utility workforce is or will be retirement-eligible by 2030.  
SOURCE: CEWD / U.S. DEPARTMENT OF ENERGY, 2025.

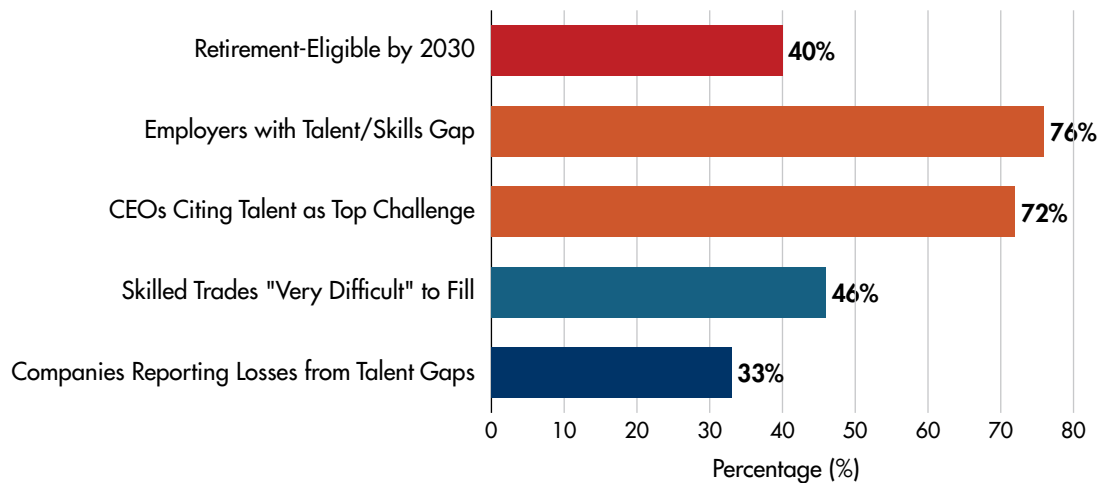
SOURCES: SEIA/ACP (2026), DOE/BERKELEY LAB (2024), GRID STRATEGIES (2024), CEWD/DOE (2025)

**Figure 1:** Energy sector growth drivers show the scale of acceleration across key indicators.

## THE SCALING INFLECTION POINT: WHEN VOLUME EXCEEDS GOVERNANCE CAPACITY

The transition from the legacy delivery model to today’s environment accelerated over a relatively short period. Projects that were once executed sequentially are now executed in parallel across multiple regions. Organizations that previously managed a limited number of concurrent sites now coordinate dozens. Proposal pipelines have expanded accordingly, with estimating teams expected to respond rapidly to a growing volume of opportunities.

These forces collectively created what can be described as a scaling inflection point: a moment when business velocity exceeds the organization’s governance capacity. Governance capacity includes the ability to technically validate scope before pricing, maintain alignment between commercial and operational functions, define clear authority over project economics, and ensure that execution roles are supported by adequate infrastructure. In the legacy model, these functions were embedded informally within experienced teams. Under modern conditions, they require deliberate design.



CEWD/DOE (2025), MANPOWER (2024), WORKDAY (2025), SHRM (2024), LIGHTCAST (2025)

**Figure 2:** Workforce pressure points illustrate the scale of talent gaps across the energy sector.

When business growth outpaces this capacity, the system does not fail immediately. Instead, it adapts by compressing validation, making technical review selective rather than systematic, and carrying forward undocumented assumptions. McKinsey’s analysis of more than 300 megaprojects found that 98% incur cost overruns or delays, with average cost overruns of approximately 80%. While these figures span all capital projects, the underlying pattern—governance systems that cannot keep pace with project complexity—is directly relevant to field-intensive services such as testing and commissioning.

### STRUCTURAL FAILURE PATTERNS IN MODERN PROJECT MANAGEMENT

Once the scaling inflection point is reached, the system develops consistent and repeatable failure patterns. These are not isolated operational issues. They are structural responses to misalignment between business expectations and project management architecture.

The first pattern emerges in proposal development. As volume increases and turnaround expectations compress, scope creation becomes detached from technical validation. Proposals appear complete but contain embedded ambiguity—equipment misclassified, testing requirements partially defined, specification nuances overlooked. These gaps surface during execution, when a technician encounters a condition not anticipated in scope.

The second pattern is the separation of authority and accountability. In the legacy model, project managers operated with continuity from proposal through execution. In the scaled model, scope is defined upstream while accountability for delivery resides downstream. Change management becomes the mechanism for addressing this gap, but its structure reflects the legacy model: routing change orders back through sales functions, introducing latency into a process that increasingly requires responsiveness. Over time, smaller scope adjustments are absorbed by field teams without formal change requests, manifesting as consistent margin erosion across projects.

A third pattern develops around the project manager’s role itself. As complexity increases, the PM function expands to absorb responsibilities that were previously distributed: technical oversight, documentation flow, data review, and multi-workstream tracking. Modern testing and commissioning projects generate large volumes of documentation daily, each requiring verification against specifications. In the absence of dedicated review capacity, this burden falls on project management, narrowing the system’s margin for error. The NERC State of Reliability Report found that over 45% of electric power incidents since 2017 were linked to organizational performance issues, many attributable to inadequate oversight and management gaps.

**Table 1:** Comparison of legacy and modern delivery model characteristics across eight structural dimensions.

Dimension	Legacy Model	Modern Reality
Project Concurrency	Low; sequential execution	High; parallel across regions
Proposal Development	Technical validation embedded	Compressed; commercially driven
PM Authority	Aligned with accountability	Separated; authority upstream
Change Management	Exception-based; discrete	Routine; continuous scope evolution
Data/Documentation	Manageable volume; direct review	High volume; exceeds PM capacity
Workforce Model	Experience-anchored; deep bench	Utilization-driven; thinner bench
Decision-Making	Close to execution	Centralized; distant from the field
Organizational Response	Informal controls sufficient	Oversight expansion; more reporting

## THE ILLUSION OF CONTROL: WHY OVERSIGHT REPLACES SYSTEM DESIGN

As delivery systems come under strain, organizations rarely interpret the problem as structural. The more common response is to view variability in outcomes as a breakdown in control, leading to additional reporting requirements, expanded approval chains, and greater executive visibility into project activity. These measures increase the appearance of control without restoring coherence.

The underlying issue is not that organizations lack visibility. In many cases, they have more data than ever. What is missing is structural alignment between how decisions are made and where technical reality resides. In the legacy model, decision-making authorities sat close to execution. In the scaled model, authority shifts upward in response to perceived risk, while those closest to the work retain responsibility for outcomes. This creates a gap between responsibility and authority that cannot be closed through oversight alone.

This is the condition in which bossiness replaces leadership. Direction is given, and accountability emphasized, but without the structural support

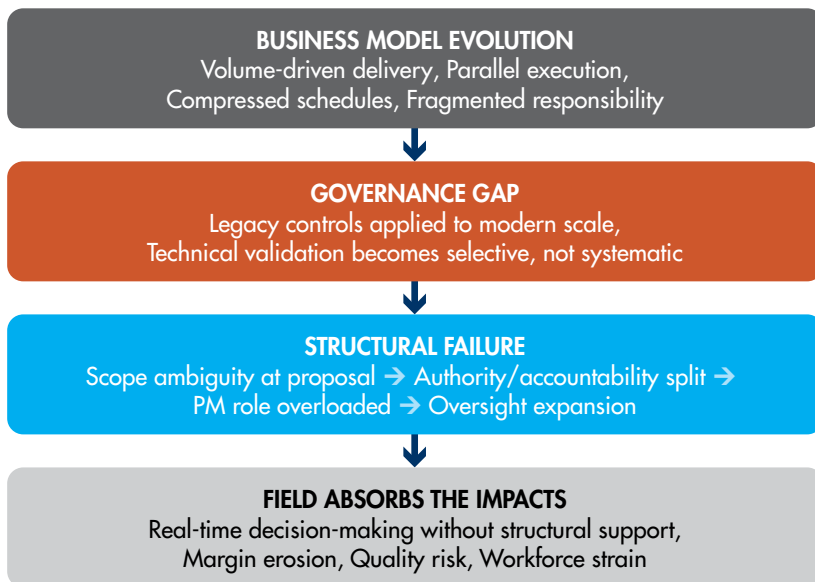
that enables effective execution. Leadership involves aligning authority, capability, and responsibility. When those elements are separated, directive management fills the gap. The system becomes increasingly dependent on individual adaptability rather than organizational design—experienced personnel navigating ambiguity, compensating for gaps, and absorbing pressure. As workforce experience levels vary and project complexity increases, this reliance becomes less reliable. The SHRM 2024 Talent Trends report found that 46% of organizations rated skilled trades positions as very difficult to fill, underscoring the fragility of depending on individual expertise to compensate for structural misalignment.

## REFRAMING PROJECT MANAGEMENT AS A BUSINESS SYSTEM

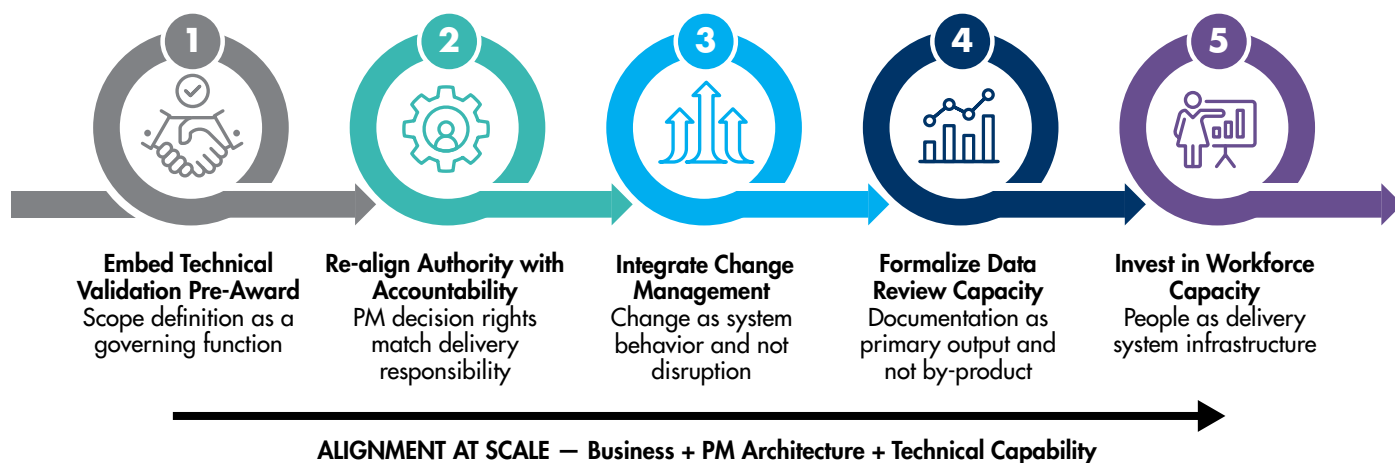
These patterns are not the result of poor execution. They are the natural outcome of applying a delivery architecture designed for a different scale and pace of work. Addressing them requires reframing project management itself—not as a coordination function, but as a core component of business system design. In a high-concurrency environment, project management becomes the mechanism through which commercial intent is translated into executable reality. When this function is not structurally aligned with the business model, the entire system fragments.

Five imperatives define this realignment.

1. Technical validation can no longer remain informal; pre-award activities must be treated as part of the delivery system.
2. Authority must be realigned with accountability, giving project managers decision rights commensurate with their delivery responsibility.
3. Change management must be integrated as normal system behavior rather than treated as a disruption.
4. Data review must be formalized as a defined organizational capability, not an implicit PM responsibility.
5. Workforce development must be recognized as a central component of the delivery system—not a parallel initiative.



**Figure 3:** *The Business model evolution creates compounding field-level pressure.*



**Figure 4:** *Realignment Imperatives for Evolving Project Management from Coordination to System Architecture*

Organizations that treat capability as secondary will continue to rely on oversight to compensate for its absence. Brookings estimates that 32 million new workers will be needed in infrastructure and other construction-related occupations over the next decade, while the Bureau of Labor Statistics projects 73,500 annual job openings for electricians alone through 2032.

## CONCLUSION: ALIGNMENT AT SCALE

The energy sector will continue to accelerate. The drivers of growth—data infrastructure, electrification, renewable generation, and grid modernization—are not temporary conditions. For organizations operating in testing and commissioning, the demands of speed, scale, and parallel execution will remain a defining feature of the work.

The legacy delivery playbook was effective because it aligned with the conditions in which it operated. As those conditions changed, the business model evolved. What has lagged is the system that translates that model into execution. The result is not a failure of effort, but a misalignment of structure. Commercial processes operate at one pace, while governance mechanisms operate at another. Authority is separated from accountability. Technical complexity increases without corresponding changes in how it is managed. The field becomes

the point at which these gaps are resolved through additional effort, real-time decision-making, and, often, unrecognized cost.

## What It Means for the Field to Pay the Price

Sustainable performance requires alignment at scale. Business strategy, project management architecture, and technical capability must evolve together. When they do, execution becomes more predictable, margin becomes more transparent, and risk becomes more controlled. When they do not, the system compensates through effort rather than design, and the cost continues to be absorbed in the field. The new business model is already in place. The question is whether the delivery system will be deliberately designed to support it. [NW](#)

*Acknowledgment: The author expresses sincere appreciation to Mehrsa Aghajafari (TRC) and Denzel Clifton (PowerX) for sharing their perspectives and field-driven insights on project management in the current energy landscape. Their contributions helped ground this article in real-world experience and added depth to the discussion around modern delivery challenges.*

## REFERENCES

U.S. Energy Information Administration (EIA). EIA Forecasts Strongest Four-Year Growth in U.S. Electricity Demand Since 2007, January 2026.

U.S. Department of Energy (DOE). DOE Releases New Report Evaluating Increase in Electricity Demand for Data Centers, December 2024.

Solar Energy Industries Association (SEIA). “U.S. Adds 58 GWh of New Energy Storage Capacity in 2025, February 2026.

Grid Strategies LLC. National Load Growth Report, 2024.

Center for Energy Workforce Development (CEWD). Energy Workforce Fast Facts, 2025. Data sourced from U.S. Department of Energy (2025) and Manpower (2024).

McKinsey & Company. “Don’t Cancel or Coddle At-Risk Capital Projects—Challenge Them,” July 2025.

North American Electric Reliability Corporation (NERC). State of Reliability Report, 2023.

Society for Human Resource Management (SHRM). SHRM Talent Trends 2024.

Brookings Institution. “Energy and Infrastructure Workforce Projections,” 2024. As cited in CEWD Energy Workforce Fast Facts.

U.S. Bureau of Labor Statistics. Occupational Outlook Handbook: Electricians, 2024.



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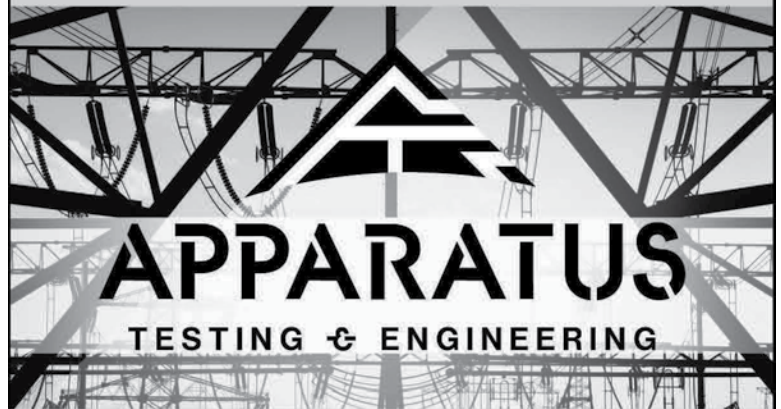
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# THE PHASE SHIFT CHALLENGE:

## RECTIFIER TRANSFORMER TURNS RATIO

BY ERIK MARIN, *Saber Power Services*

Transformer Turns Ratio (TTR) testing is a fundamental diagnostic method used to verify transformer winding integrity, tap-changer position, and compliance with nameplate data by comparing measured voltage ratios with theoretical values. This test enables early detection of winding deformation, incorrect internal connections, manufacturing defects, or tap-changer issues. However, when applied to rectifier transformers, complexity increases significantly due to multiple secondary windings, specialized interconnections, and intentional phase shifts required for multi-pulse rectification.

Hydrogen production rectifier transformers used in industrial rectifier and power electronic applications present unique challenges that differentiate them from standard power transformers. These units often incorporate complex winding arrangements, phase-shifting windings, and multiple vector groups within a single transformer to achieve multi-pulse rectification, such as 24-pulse configurations. As a result, the internal electrical relationships between windings are inherently more complex and cannot be accurately evaluated using conventional three-phase TTR test methods.

In a rectifier transformer, phase displacement, asymmetrical winding geometry, and internal interconnections may produce misleading results when standard TTR techniques are applied. This can increase the risk of false indications or, conversely, mask actual winding or connection issues. For this reason, IEC

61378-1 defines specialized test methodologies specifically tailored to the construction and electrical behavior of rectifier transformers.

This case study focuses on the application of the IEC 61378-1 single-phase cyclic permutation method for TTR testing of a three-winding, 24-pulse hydrogen production rectifier transformer. The objective is to demonstrate how this methodology enables accurate, repeatable, and directly comparable field measurements, even in the presence of complex vector groups and phase-shifting connections. The study further validates the effectiveness of this approach by directly comparing field test results with factory acceptance test (FAT) measurements.

For consistency and direct comparability, this case study is based exclusively on transformer turns ratio (TTR) measurements performed at Tap Position 1. Field tests and factory



PHOTO: © ISTOCKPHOTO.COM/PORTFOLIO/DOUGLAS\_RISSING

acceptance test results correspond to the same tap position, ensuring that the comparison reflects test methodology performance rather than tap-dependent variations.

### **CHARACTERISTICS OF A 24-PULSE HYDROGEN PRODUCTION RECTIFIER TRANSFORMER**

The rectifier transformer for hydrogen production is not a standard transformer. It is a specialized power-supply device designed specifically for the high-energy, continuous process of water electrolysis. It integrates voltage transformation, electrical isolation, and harmonic management. A 24-pulse converter transformer typically consists of one high-voltage three-phase winding and two

low-voltage winding groups supplying dual six-pulse rectifier bridges. These windings are magnetically coupled but electrically independent and intentionally phase-shifted by 30 electrical degrees.

A hydrogen production rectifier transformer is an indispensable component of modern hydrogen production systems, enabling the efficient conversion of AC power to the stable DC required for electrolysis. Its advanced features, including multi-pulse designs, high efficiency, precise regulation, and robust construction, ensure reliable operation in large-scale green hydrogen projects and industrial applications.

As the demand for green hydrogen grows, the role of rectifier transformers will become

even more critical, driving innovation and expansion in the global market. Hydrogen production rectifier transformers are used in large-scale green hydrogen projects and industrial hydrogen generation, particularly those integrated with renewable energy sources.

The transformer performs three key functions in hydrogen production:

1. **Voltage conversion.** Steps down high-voltage AC (e.g., 10 kV, 35 kV) to the low-voltage DC (e.g., 160 V–600 V) required by electrolyzers, which operate on DC power to drive the electrolysis reaction.
2. **Power stabilization.** Provides precise voltage and current regulation to maintain stable power output, even amid fluctuations in renewable energy sources (e.g., wind, solar) or grid load changes. This stability is critical to prevent electrolyzer damage and optimize hydrogen yield.
3. **Harmonic mitigation.** Uses multi-pulse designs (e.g., 12-pulse, 24-pulse, 48-pulse, or 96-pulse) to reduce harmonic distortion in the output current. Harmonics, unwanted frequencies generated by rectification,

can degrade power quality, increase energy losses, and interfere with other equipment. Multi-pulse topologies (achieved via phase-shifted windings or parallel bridges) minimize these distortions, complying with standards like IEEE 519. In a typical 24-pulse arrangement, two 12-pulse circuits are connected in parallel with an appropriate phase shift to achieve harmonic cancellation. The 11th and 13th harmonics now disappear from the supply current waveform, leaving the 23rd as the first to appear. Only harmonics of the order  $24k \pm 1$ , where  $k = 1, 2, 3, 4$ , and so forth, will be present in a 24-pulse system.

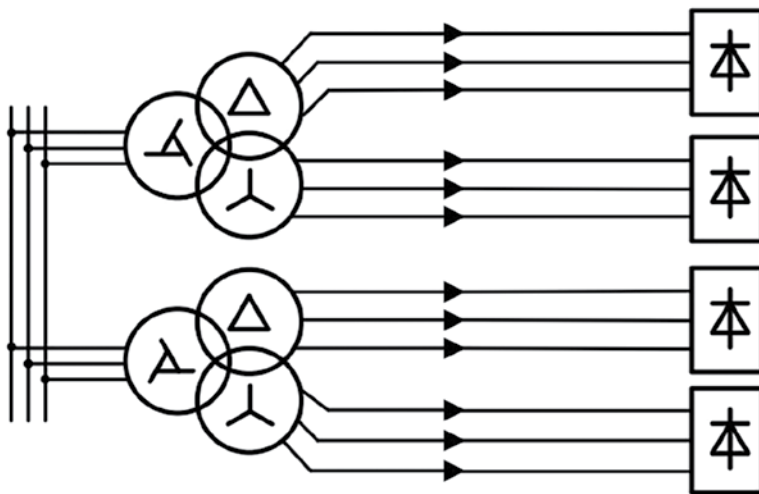
## TRANSFORMER TOPOLOGY

The configurations for a 24-pulse rectifier transformer, which includes the phase-shift transformers, have side-extended delta-connection primary windings and four secondary windings with conventional delta and Y connections, respectively. The unit used in this analysis incorporates automatic regulation with extended-delta windings connected in parallel and phase-shifted on the primary side, along with four secondary star–delta outputs.

A traditional 24-pulse rectifier transformer uses two 12-pulse, phase-shifting rectifier transformers to form a 24-pulse rectifier to eliminate most of the harmonics on the grid side, as shown in Figure 1. Nevertheless, the large footprint of two transformers affects the layout of other equipment in the system. Considering the limited physical size of available space in prefabricated substations, a new 24-pulse rectifier transformer can realize a special phase-shifting angle by using a delta-extended connection, which can improve efficiency and greatly reduce the size of the area.

## Multi-pulse configurations

The most common designs include 12-pulse, 24-pulse, 48-pulse, and even 96-pulse systems. For example, a 96-pulse transformer (e.g., CEEG’s ZHSFT series) uses multiple parallel bridges with phase-shifted windings to



**Figure 1:** Typical Topology of a 24-Pulse Rectifier System

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reduce total harmonic distortion (THD) to below 10%, ensuring grid compatibility and protecting electrolyzers from voltage ripple.

**High Efficiency**

Modern transformers achieve efficiencies of 97.5% or higher at full load, minimizing energy waste. This is enabled by low-loss core materials (e.g., grain-oriented silicon steel) and optimized winding designs.

**Precise Regulation**

Combines on-load tap changers (OLTC) for coarse voltage adjustment ( $\pm 10\%$  stepwise) and thyristor phase-angle control for fine-tuning (continuous 0–100% output adjustability). This hybrid system ensures seamless adaptation to dynamic process requirements, such as changes in electrolyte concentration or production demand.

**Multi-Winding Designs**

One purpose of a multi-winding rectifier transformer is to minimize the harmonics injected into the grid. This is achieved by using rectifiers with higher pulse numbers (most commonly 12-pulse, 18-pulse, 24-pulse, 30-pulse, or 36-pulse) in combination with a corresponding phase-shifting input transformer. This means that the rectifier transformer has multiple secondary windings with relative phase displacement. Such phase shifting helps to eliminate certain harmonics from the spectrum seen on the primary side of the transformer. Generally, the higher the rectifier pulse number, the more the lower-order harmonics can be eliminated or minimized.

**Classical Winding Connections**

The smallest phase shift between windings is 30 degrees. This unit is called "one hour" in clock notation. Such a phase shift is suitable for a 12-pulse system, i.e., a three-winding transformer with two secondary windings phase-shifted 30 degrees. Vector groups include Yy0d1, Dd0y11, etc.

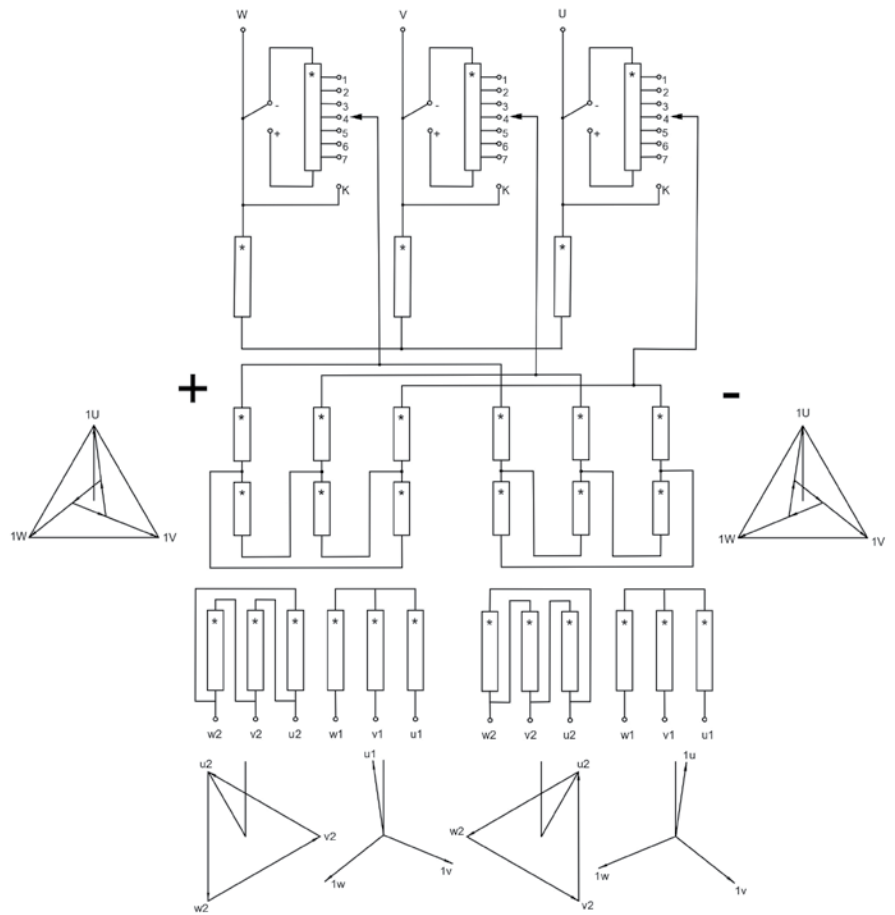
For the rectifier to achieve a higher pulse number with less harmonic distortion, these

additional winding connections are necessary: zig-zag (denoted as Z), extended delta, and polygon delta.

These winding connections allow phase shifts smaller than 30 degrees to be achieved. Theoretically, an arbitrarily small phase shift can be achieved, but factors such as manufacturing tolerances, cost, and overall complexity set the practical limits.

The configuration for the case under analysis is shown in Figure 2.

Voltage rating: 12.5 kV / 526 V  
 Power rating: 6630 kVA  
 Frequency: 60 Hz.  
 Number of phases: 3  
 Type: ZHSZ-6630/12.5  
 Vector Group: Ya0 + DE/dy – DE/dy



**Figure 2:** Rectifier Transformer Configuration

### LIMITATIONS OF CONVENTIONAL TTR TESTING

Conventional TTR methods assume symmetrical three-phase windings with direct phase correspondence. Due to the internal connections and phase displacement present in converter transformers, direct phase-to-phase ratio measurements produce misleading results.

TTR testers automatically perform ratio measurements, along with excitation-current and phase-shift measurements. These instruments carry out the turns-ratio test phase by phase, short-circuiting the adjacent phases not involved in the measurement, as recommended by transformer standards.

Testing a three-phase rectifier transformer with non-conventional vector groups and a wide variety of winding configurations is significantly more complex. These designs often involve phase mixing and shared magnetic cores; for example, half of the winding on core U may be energized from phase V, and so on. Such characteristics greatly complicate the algorithms required for automatic testing.

When the phase displacement between the line-side and rectifier-side voltages is not a multiple of 30 degrees, the simplest method is to perform the measurement using modern TTR instruments that now include direct menu options for ratio, excitation-current, and phase-shift measurements tailored to these unconventional vector groups. If this instrument is not available, then use IEC 61378-1, *Converter Transformers*.

### TEST PRINCIPLE AND METHODOLOGY

IEC 61378-1 specifies a single-phase excitation method with cyclic permutation of the high-voltage phases. During each measurement, one HV phase is energized while the remaining two are short-circuited, and the induced voltage is measured on the corresponding low-voltage phase.

#### Voltage Ratio Reconstruction

For each phase, two coefficients ( $K_b$  and  $K_c$ ) are obtained. The effective voltage ratio is reconstructed using the IEC-defined analytical expression that compensates for phase displacement and magnetic coupling effects.

Field TTR tests were performed using a single-phase cyclic permutation method. The values  $K_b$  and  $K_c$  (the average of the three measurements) are used in the following equation for the effective voltage ratio:

$$\rho = \frac{K_b}{\sqrt{1 + (K_b/K_c)^2} - K_b/K_c}$$

where  $K_b$  and  $K_c$  are the averaged ratios obtained from cyclic permutation single-phase measurements.

This equation compensates for internal winding geometry and phase displacement inherent to rectifier transformers.

The turn ratio measurements should be performed in the single-phase configuration, feeding the HV phase (U, V, W) using a cyclic permutation with the other two phases short-circuited, against the respective LV phase (u, v, w) according to the following combinations (Table 1):

**Table 1:** *Single-Phase Ratio Combinations*

$K_b$	$K_c$	$K_b$	$K_c$	$K_b$	$K_c$
<b>U-VW</b>	<b>U-VW</b>	<b>V-WU</b>	<b>V-WU</b>	<b>W-UV</b>	<b>W-UV</b>
<b>U-V</b>	<b>U-W</b>	<b>V-W</b>	<b>V-U</b>	<b>W-U</b>	<b>W-V</b>

### TEST RESULTS AND INTERPRETATION

Measured ratios were reconstructed using the IEC analytical formula and compared against calculated nominal values. Phase-to-phase deviations remained within acceptable IEC limits, confirming winding symmetry and correct tap configuration.

U Phase:

$$U = \frac{25.982}{\sqrt{1 + (25.982/22.296)^2 - 25.982/22.296}} = 23.7912$$

V Phase:

$$V = \frac{25.984}{\sqrt{1 + (25.984/22.294)^2 - 25.984/22.294}} = 23.7904$$

W Phase:

$$W = \frac{25.988}{\sqrt{1 + (25.988/22.300)^2 - 25.988/22.300}} = 23.7959$$

**Table 2:** Field Single-Phase Ratio Measurements

Vectorial Group	Phase	Calculated Kb and Kc		Primary Voltage	Secondary Voltage	Calculated	Measured	% Error Calculated vs. Measured	% Error between Adjacent Coils
GROUP 1 YΔ	U	Kb	25.982	12500	526	23.764	23.791	0.11	0.02
		Kc	22.296						
	V	Kb	25.984				23.790	0.11	
		Kc	22.294						
	W	Kb	25.988				23.796	0.13	
		Kc	22.300						
GROUP 2 YY	U	Kb	20.572	12500	526	23.764	23.549	0.92	0.21
		Kc	33.464						
	V	Kb	20.574				23.550	0.91	
		Kc	33.46						
	W	Kb	20.526				23.501	1.11	
		Kc	33.468						
GROUP 3 YΔ	U	Kb	22.300	12500	526	23.764	23.796	0.13	0.05
		Kc	25.988						
	V	Kb	22.294				23.790	0.11	
		Kc	25.984						
	W	Kb	22.286				23.784	0.08	
		Kc	25.98						
GROUP 4 YY	U	Kb	33.468	12500	526	23.764	23.553	0.90	0.01
		Kc	20.576						
	V	Kb	33.46				23.550	0.91	
		Kc	20.574						
	W	Kb	33.466				23.551	0.90	
		Kc	20.574						

**Table 3:** *Factory Acceptance Testing Phase Ratio Measurements*

Vectorial Group	Phase	Primary Voltage	Secondary Voltage	Calculated	Measured	% Error Calculated vs. Measured	% Error between Adjacent Coils
GROUP 1 YΔ	U	12500	526	23.764	23.800	0.15	0.11
	V				23.815	0.21	
	W				23.790	0.11	
GROUP 2 YY	U	12500	526	23.764	23.562	0.86	0.32
	V				23.520	1.04	
	W				23.594	0.72	
GROUP 3 YΔ	U	12500	526	23.764	23.802	0.16	0.11
	V				23.786	0.09	
	W				23.812	0.20	
GROUP 4 YY	U	12500	526	23.764	23.577	0.79	0.22
	V				23.572	0.82	
	W				23.525	1.01	

## ACCEPTANCE CRITERIA

Typical acceptance limits for converter transformers specify that the ratio tolerance shall be within  $\pm 1.0\%$ . In addition, IEEE Std. C57.18.10, *IEEE Standard Practices and Requirements for Semiconductor Power Rectifier Transformers*, establishes that the allowable tolerance for phase angle displacement is  $\pm 1$  degree, and the voltage ratio tolerance is  $\pm 1\%$ , unless otherwise specified.

Furthermore, the acceptance evaluation may also reference the requirements defined in ANSI/NETA ATS–2025, *Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems*, and ANSI/NETA MTS–2023, *Standard for Maintenance Testing Specifications for Electrical Power Equipment and Systems*, as applicable. These standards provide additional guidance for field testing, measurement practices, and performance assessment to ensure that the transformer meets operational and reliability expectations under actual service conditions.

## CONCLUSIONS

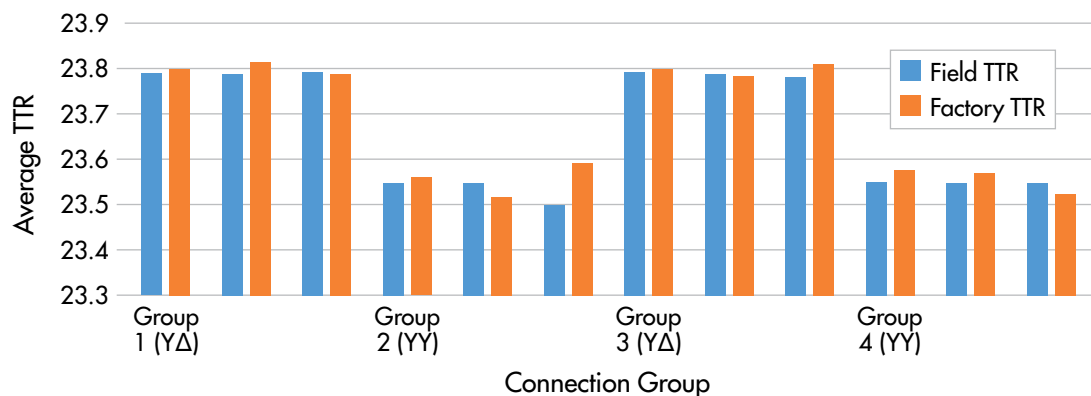
The comparison between field and factory TTR results demonstrates a strong correlation when the IEC 61378-1 single-phase cyclic permutation method is correctly applied. The

results validate field TTR testing as a reliable commissioning and condition assessment tool for 24-pulse rectifier transformers.

Beyond numerical correlation, this case study highlights the practical advantages of applying IEC 61378-1 test methodology during field testing. The cyclic permutation approach compensates for internal winding geometry, phase displacement, and complex vector groups commonly found in converter transformers, which are not adequately addressed by conventional three-phase TTR methods. As a result, testing personnel can obtain meaningful and repeatable measurements without relying on calculated or inferred ratios.

From a commissioning and maintenance perspective, the ability to directly compare field measurements with factory acceptance test data at the same tap position provides a high level of confidence in transformer integrity. This methodology allows early detection of winding issues, tap-changer discrepancies, or connection errors before energization, thereby reducing operational risk and unplanned outages.

Additionally, the methodology discussed here is not limited to the specific vector group evaluated. The same principles can be applied to transformers with star (Y), delta (D),



**Figure 3:** Comparative Bar Chart of Field and Factory Average TTR by Connection Group  
This chart compares average transformer turns ratio (TTR) values measured during field commissioning and factory acceptance testing for YΔ and YY connection groups at Tap Position #1.

extended delta, polygon, and other phase-shifting connections, regardless of whether the phase-shifting winding is located on the regulating or rectifier side. This flexibility makes the single-phase cyclic permutation method a valuable and broadly applicable tool for testing technicians working with converter transformers in industrial environments.

As shown in Figure 3, the average TTR values measured in the field closely match the corresponding factory acceptance test results across all connection groups, with deviations remaining well within acceptable limits. This comparison confirms the reliability and repeatability of the single-phase cyclic permutation method when applied during field testing. [NW](#)

## REFERENCES

IEC 61378-1, *Converter Transformers*, Part

1: Transformers for Industrial Applications, Annex H.

IEEE C57.18.10-2021, *IEEE Standard Practices and Requirements for Semiconductor Power Rectifier Transformers*.

S. G. Jeyaraj, R. Milne, and G. Mitchell. “On-Site Testing of Special Transformers,” *10th IET International Conference on AC and DC Power Transmission* (ACDC 2012), Birmingham, UK, 2012, pp. 1-6.

Mengxia Wang, Yong Li, Bonan An, Longfu Luo, Pencheng Wang, and Lin Gang. (2019). “A New 24-Pulse Rectifier Transformer with Delta-extended Connection,” *IOP Conference Series: Earth and Environmental Science*. NOTE: This is an Open Access work distributed under the Creative Commons Attribution (CC BY 3.0) license.

Der Chun Shih, Ling-Chung Hung, and Chun Ming Young. “The Harmonic Elimination Strategy for a 24-Pulse Converter with Unequal-Impedance Phase-Shift Transformers,” *2013 1st International Future Energy Electronics Conference (IFEEC)*, Tainan, Taiwan, 2013, pp. 783–788.



**Erik Marin** is a Field Engineer for Saber Power Services, LLC. He is a NETA Level IV Senior Technician with more than 15 years of experience in electrical power systems, maintenance, and field diagnostics. His expertise includes acceptance and maintenance testing of medium- and high-voltage equipment such as power transformers, switchgear, circuit breakers, control systems, and grounding systems in accordance with NETA, IEEE, and IEC standards. He previously worked as an Electrical Distribution Superintendent at Petróleos de Venezuela (PDVSA), where he oversaw electrical distribution operations and maintenance programs for substations and oil-production facilities. Marin holds a BS in Electrical Engineering from the University of Zulia in Maracaibo, Venezuela, evaluated in the United States as equivalent to a regionally accredited engineering degree.

# UPDATE ON THE LBCC HIGH VOLTAGE TEST TECHNICIAN PROGRAM

BY NENO PASIC, *Tony Demaria Electric, Inc.*

## PART 2: FROM CLASSROOM TO CAREER AND BEYOND

Part 1 in the Spring issue of *NETA World* provided a retrospective on the implementation of the NETA Electrical Power Testing Technician (EPTT) curriculum at Long Beach City College (LBCC). That story is important, but it is only half of it. The real measure of success is what happens after students leave the classroom and enter the field.

Over the past several years, a growing number of LBCC High Voltage Test Technician (HVTT) program graduates have successfully transitioned into the workforce, and some of them have joined NETA Accredited Companies. One of those graduates is Manuel Coronado Perez, who is now employed by RESA Power, a NETA Accredited Company. Manny's path into the industry is a great example of what this program was designed to do. I recently interviewed Manny.



*Manuel Coronado Perez*

### A GRADUATE'S PERSPECTIVE: MANUEL CORONADO PEREZ (RESA POWER)

**Q:** Can you tell us about your background before enrolling in the LBCC High Voltage Test Technician program?

**Perez:** Before enrolling in the LBCC High Voltage Test Technician program, I was a baker working in high-end bakeries around the Los Angeles area. I lost my passion for that trade, so I went online to see if I could learn how to become an electrician.

**Q:** What initially attracted you to the LBCC High Voltage Test Technician program?

**Perez:** What drew me to it was that it was an exclusive program at LBCC. I didn't realize you could make a career out of electrical testing. In my head, I thought electrical work was just lineman work, but I decided to check it out and see what was involved.

**Q:** What were your career goals at the time, and how did this program fit into those plans?



*Doble Demo  
Van with LBCC  
HVTT Students*

**Perez:** My career goal at the time was to find something more meaningful and not be boxed in one area. I knew this program was a chance to get out of that situation.

**Q:** What was your overall experience like in the program?

**Perez:** My experience was overall positive. I learned a lot about the world of NETA and more about the test-technician side of the trade. I have to thank Erfan Bamdad and Neil Sepulveda for making the experience an enjoyable one.

**Q:** Were there any specific courses, labs, or topics that stood out to you as particularly valuable or impactful?

**Perez:** The hands-on lab environment was one thing that stood out to me, especially since I was in a completely different trade. We learned on the equipment that is being used in the field, figured out how it worked, and used it on test equipment. Now that I'm with a NETA Accredited Company, those hands-on lessons are putting me ahead of other new

hires in the field and helping me excel in the company's bootcamp orientation.

**Q:** How would you describe the instructors and their approach to teaching?

**Perez:** Their approach to teaching was as though the students were brand new to the field with no prior knowledge of electrical work. Erfan and Neil were eager to answer questions and willing to help any student who was engaged in the material being taught.

**Q:** What was the most challenging part of the program, and how did you overcome it?

**Perez:** The most challenging part was the math. Trigonometry is involved, and that was a shock to me. I would never have imagined using trigonometry in my field of work.

**Q:** How did the program prepare you for entering the electrical testing field?

**Perez:** Everything we did in the program is involved in what we do in the field. Hi-pot



*Neil Sepulveda, PE and NETA Level 4 Senior Certified Technician of Tony Demaria Electric, LBCC HVTT curriculum instructor, and recipient of the 2026 NETA Outstanding Service Award at the PowerTest26, is doing what he does best — teaching!*

testing, insulation testing, transformer turns-ratio testing, and much more. Safety was a big thing while in the HVTT program, and it is an even bigger topic in the field.

**Q: How did completing the program get your current job? Are you planning to take the NETA Level 2 Certified Assistant Technician exam?**

**Perez:** Representatives from my current company came to LBCC to recruit students who were on the path to complete the HVTT program. They saw value in the students and

were willing to offer very enticing pay and benefits to work for them.

Yes, I plan on taking my Level 2 exam. The company I'm with is encouraging me and helping me make that happen.

**Q: Looking back, how has completing the program impacted your career and personal life, and what advice would you give to someone considering enrolling?**

**Perez:** A lot of places claim to have something for you once you finish schooling, and you end up with nothing. Not this program. This program has significantly impacted my life in being able to support myself and my loved ones. I will say that before considering enrolling, you have to be okay with travel work. There will be instances when you will travel out of state, away from family, for long periods of time.

Manny's experience reflects exactly what we were aiming for when we pushed to establish this program. It creates a direct path from the classroom to the field, providing immediate value to both the student and the employer, but frankly, also to the world.

## PROGRAM GROWTH

As the program continues to grow and mature, it is also being evaluated to ensure it remains aligned with NETA, its current standards, and the many developments that have taken place since the program was first launched in 2018. The NETA Training Committee will review the HVTT program as part of its broader effort to evaluate all NETA-approved training. This includes looking at potential updates, enhancements, and the addition of new subject areas. One example already under discussion is adding relay testing to the curriculum, which would further strengthen the program and better reflect the industry's evolving needs. The program will then undergo a regular three-year review.

## A Look at the Numbers

As of today, a total of 55 students have completed the HVTT coursework since the program's inception. Of that number:

- 23 students graduated with an AS in electrical technology.
- 32 students earned the LBCC Electrical Technology, High Voltage Test Technician Certificate of Achievement or the LBCC High Voltage Test Technician Certificate of Achievement

## Next Steps

In my opinion, the next logical step is to align the program more closely with NETA's new National Guideline Standards (NGS) Apprenticeship framework. The opportunity here is significant. LBCC already provides the academic and hands-on foundation, and the apprenticeship model can build on that by formalizing on-the-job training, wage progression, and long-term career development.

My vision is a hybrid structure where students complete the HVTT program and then transition directly into a registered apprenticeship with a NETA Accredited Company, creating a seamless pipeline. This approach would also allow flexibility, with portions of the apprenticeship-related instruction delivered through LBCC, NETA's new Learning Management System, or a combination of both.

## MOVING FORWARD

Looking beyond LBCC, one important takeaway is that the model is replicable. The framework is built. The curriculum exists. The industry demand is clear. What made LBCC successful was not only timing, but also alignment. Strong industry support from NETA Accredited Companies to NETA Corporate Alliance Partners, committed faculty, and a willingness to work through administrative and structural challenges were all key factors. Other colleges can do the same, but it requires engagement from all sides early in the process.

Many lessons were learned along the way, but three stood out:

- First, having a committed internal champion at the college level is critical. In our case, there were two: Scott Fraser,

at that time LBCC Electrical Technology Professor and Trades & Industry Department Chair, and the late John Hauck, at that time LBCC Electrical Technology Instructor, played that role.

- Second, industry involvement cannot be passive. It requires continuous engagement, from curriculum input to equipment support and classroom participation.
- Third, expectations must be managed on all sides. Building something like this takes time, persistence, and a willingness to adapt. Many hours went into it all: meetings, discussions, brainstorming over lunches and dinners, bypassing hurdles and obstacles along the way.

Writing articles, giving presentations at NETA PowerTest and EPIC conferences, visiting evening classes, and talking to students and staff are important to support ongoing engagement with the program. One such visit took place on May



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*Megger presented Best Practices and Techniques for Cable Fault Locating to the HVTT students.*

12, when NETA Board Member Leif Hoegberg of Electrical Reliability Services and I gave a presentation about NETA to the LBCC students. NETA provided each student with a NETA tool bag containing additional giveaways (NETA pin, cap, water bottle, etc.) as well as additional giveaways for other attendees. Other attendees at this and similar events usually include other LBCC Electrical Technology students and staff. The idea is to spark their interest in the HVTT program and encourage them to choose it as their career, especially those who are undecided and attend LBCC General Industrial Electrician classes and coursework. Doble also brought their Demo Van to LBCC again in May.

Employer partnerships have proven to be one of the program's strongest components. NETA Accredited Companies like Tony Demaria Electric (TDE), RESA Power, Vertiv, and others have not only hired graduates but also actively participated in recruiting and provided guest speakers and mentors. Others, like Asplundh Electrical Testing, recognize the opportunity and have scheduled classroom visits to present potential employment and internship opportunities to LBCC HVTT students. A more structured mentorship model, where students are paired with experienced

technicians early in the program, could further accelerate readiness and retention. This is already happening informally, but formalizing it would strengthen the overall pipeline.

The need for qualified electrical testing technicians will only increase. The infrastructure we support is becoming more complex, more critical, more overloaded, and more dependent on reliability. At the same time, the workforce is aging, and the number of new entrants is not keeping pace. Training programs like LBCC's HVTT are not just helpful; they are a must! Technology will continue to evolve, testing methods will continue to advance, but the need for well-trained, safety-focused technicians will remain constant.

At its core, this program shows what can happen when the right people come together with a shared goal and are willing to put that vision into practice, dedicating and volunteering significant time to making it happen.

## CONCLUSION

The LBCC HVTT program is not just a success story. It is a working example of how to build a sustainable pipeline for the next generation of electrical testing technicians.

If educational institutions, industry leaders, unions, and organizations like NETA can align and set aside competing interests, there is potential to significantly expand this model nationwide. The need is there. The framework is there. What remains is execution. [NW](#)



***Neno Pasic** is a NETA Accredited Representative and Tony Demaria Electric (TDE) Chief Information Officer. Neno has been working with TDE for over 24 years. He is the NETA Volunteer Engagement Committee Chair, a NETA Training Committee Member, a NETA Promotions and Marketing Committee Member, and an IEEE and NFPA Member. Neno earned a BS in computer information systems, business administration from California State University, Dominguez Hills (CSUDH), along with project management and information technology management certificates from the University of California, Los Angeles (UCLA). He received the 2021 NETA Outstanding Achievement Award and the 2025 NETA Excellent Service Award.*

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# USING SFRA

## TO IDENTIFY A WINDING WITH A SHORTED TURN

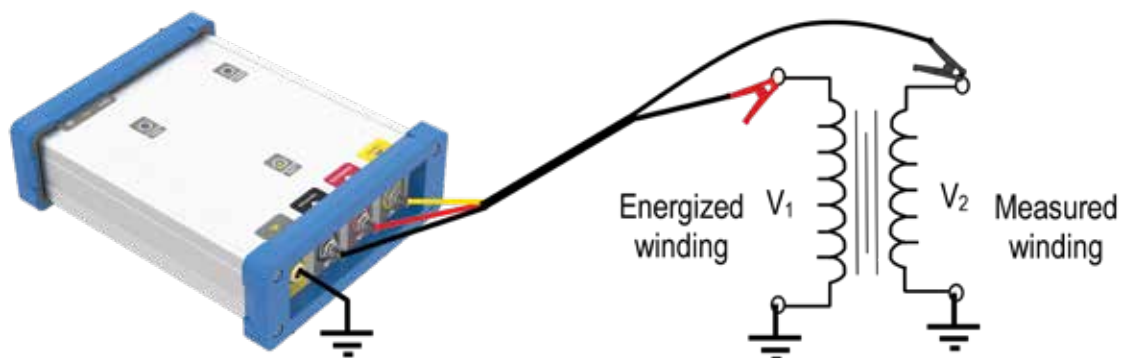
LONG PONG, *Doble Engineering*

The sweep frequency response analysis (SFRA) test is a powerful and sensitive method for assessing the mechanical and electrical integrity of a transformer core/coil assembly. SFRA includes two tests: an open test and a short-circuit test. Both test a complex network of inductances, capacitances, and resistors, and frequently successfully detect the presence of an electrical failure, including a shorted turn.

Since windings are electromagnetically coupled, the SFRA trace obtained from one winding may be affected by an electrical fault in another winding. Identifying which winding has the problem is challenging. This article describes the experience with four units in which the faulty winding was identified by employing the inductive interwinding SFRA setup, referred to here as the SFRA ratio test.

### INTRODUCTION

The objective of the traditional voltage ratio test is to verify the correct number of turns and the internal connections. It serves as a benchmark to assess possible future damage, e.g., shorted turn(s). While theoretically the change in the voltage ratio data should point to the winding with a shorted turn, in practice, the data may not paint a clear picture.



**Figure 1:** Basic Setup for SFRA Ratio Test



PHOTO: © ISTOCKPHOTO.COM/PORTFOLIO/ALEKIS999

To address this, the inductive interwinding SFRA setup was employed. This setup offers a frequency segment (less than 200 Hz), in which the ratio of the induced voltages is closely proportional to the turns ratio. The direction of the deviation in the aforementioned SFRA trace segment points to the winding that hosts the defect. The following discussion describes the basics of the test along with the results of several field investigations.

**BASIC PRINCIPLE**

The basic setup of the SFRA ratio test employs connections for the inductive interwinding SFRA test (Figure 1). The high-voltage winding is excited by the test voltage ( $V_1$ )

applied between the red lead and ground, and the secondary voltage ( $V_2$ ) is measured between the black lead and ground.

The expression for the SFRA magnitude in dB is:

$$20 \log \left( \frac{V_2}{V_1} \right) = dB \tag{1}$$

From (1), the ratio of voltages is:

$$SFRA \text{ Ratio} = \frac{V_1}{V_2} = 10^{\frac{-dB}{20}} \tag{2}$$

The relevant ratio data can only be obtained in the frequency segment where the ratio

of voltages corresponds to the ratio of turns. For the units tested, the data were analysed in the frequency segment where the SFRA ratio remained constant, i.e., at frequencies below 200 Hz.

The selection of frequency for SFRA ratio measurement is based on the following criteria:

1. The frequency must be in the voltage turn-ratio region (< 200 Hz).
2. Avoid the harmonic frequencies of the power system and the integer multipliers.
3. The lower the frequency, the lower the influence of the capacitive components on the voltage turns ratio.

Therefore, 38 Hz is the best frequency to meet the above criteria. A different frequency could be selected to read the SFRA ratio in the ratio region, but it could be affected by a power system disturbance.

The spread between the SFRA traces of the various phases can be useful in detecting and confirming the presence and location of the defect (3):

$$\% \Delta_{38 \text{ Hz}} = \frac{\text{Max}(R_1, R_2, R_3) - \text{Min}(R_1, R_2, R_3)}{\text{Average}(R_1, R_2, R_3)} 100 \quad (3)$$

In (3), are the SFRA ratio values obtained from the trace of each phase? To identify which winding has the shorted turn, the trace deviation in the segment below 200 Hz is examined.

The analysis is based on calculating the deviation for a set of three traces using

Equation (3). Then, if the 0.5% limit (derived from field data) is violated, the trace that deviates the most from the other two is identified. The assumption is that the defect exists in only one phase.

The trace segment will move upward (towards a higher ratio value) if a shorted turn is present in the low-voltage winding, as shown in Unit 2 and Unit 3. The deviation can increase with frequency, resulting in increased deviation at higher frequencies, as shown in Unit 2. This makes the defect more obvious.

The trace segment will move downward (towards a lower ratio value) if the shorted turn is present in the high-voltage winding, as shown in Unit 4.

To assist the field tester, the rule mentioned above is implemented in the SFRA application that provides two features:

1. Graphic results of magnitude (ratio) for direct ratio reading
2. Ratio analysis of the selected three-phase traces to read the ratio, determine the ratio deviation, and identify the defective phase along with the winding sheltering the shorted turns, as shown in Table 2

## CASE STUDY

Four transformers were used to demonstrate the SFRA ratio application. The four units have different winding configurations with conditions ranging from good to conditions with a fault in the primary or secondary winding, as summarized in Table 1. The test results are summarized in Figure 2–Figure 5.

**Table 1:** *Transformers Tested*

Unit #	Condition	Winding	Manufacturer	MVA and Voltage at Tested Tap Position
1	Good	Dyn1	Electric Power Service	12.5 MVA, 34.5/13.8 kV
2	Fault on LV	Dyn1	Westinghouse	20 MVA, 100/12 kV
3	Fault on LV	YNd1	Westinghouse	41.6 MVA, 120.75/13.2 kV
4	Fault on HV	Dyn1	General Electric	33.6 MVA, 101.25/46.24 kV

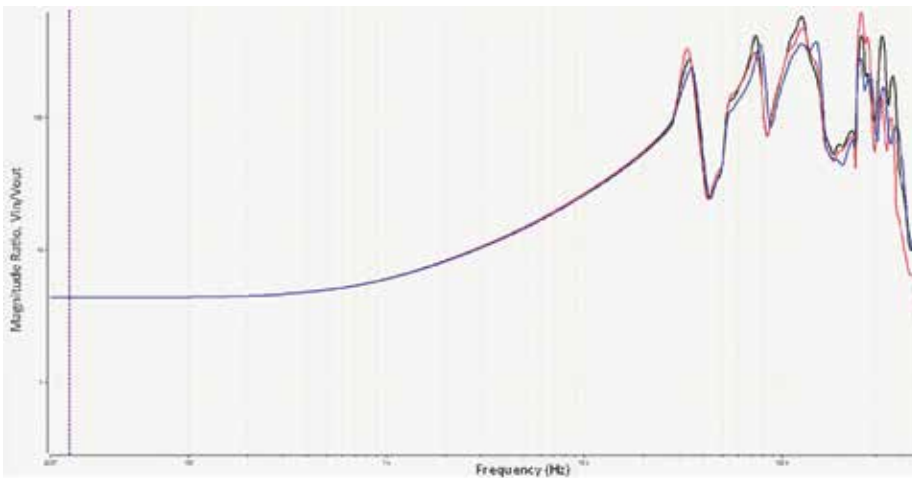
# CORPORATE ALLIANCE CORNER – ADVANCEMENTS IN INDUSTRY

## DATA REVIEW

In each figure, the left column displays the graphical results of SFRA Ratio tests, with three selected traces coloured black, red, and blue for phases A, B, and C, respectively. The right column shows the ratio analysis of the three traces. The analysis performs four tasks:

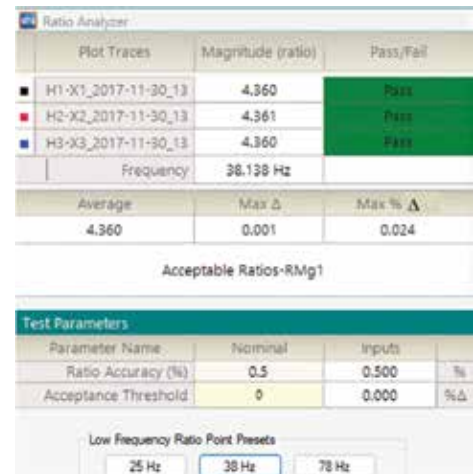
1. Measures the ratio values at the selected frequency by the cursor
2. Calculates the maximum deviation among the three phase ratios
3. Compares the deviation to the 0.5 % limit in the Inputs field
4. Rates each phase ratio pass or fail and provides a diagnostic message. If it fails, the results will indicate which winding has the shorted turns in the fail phase.

### Graphic Results of Magnitude Ratio



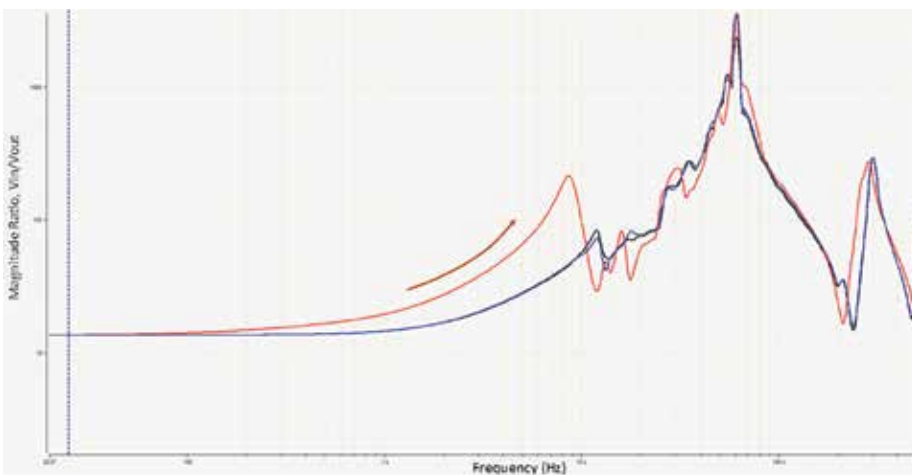
**Figure 2:** Unit 1, Dyn1, NP Ratio = 4.33

### Ratio Analyzer



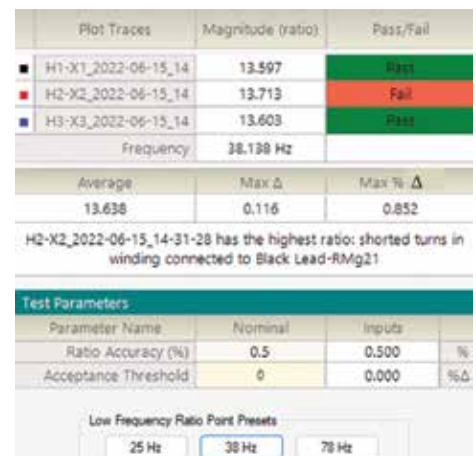
$\Delta_{38\text{Hz}} = 0.024\%$  No Fault Detected

### Graphic Results of Magnitude Ratio



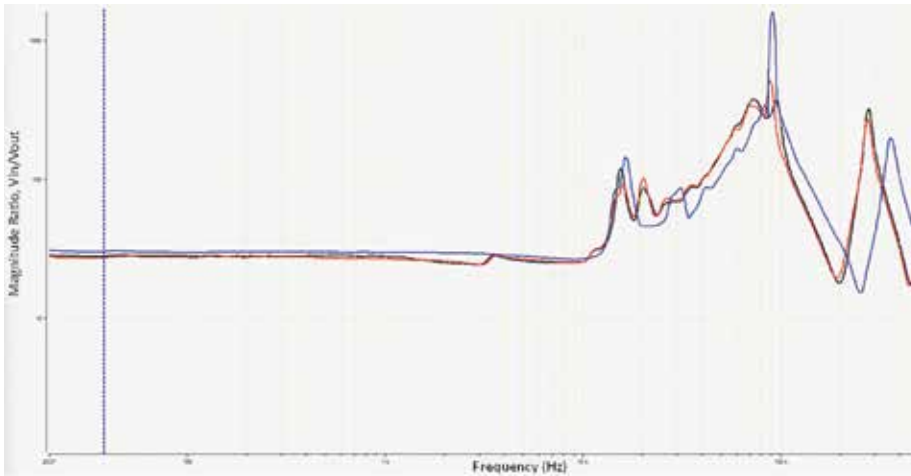
**Figure 3:** Unit 2, Dyn1, NP ratio = 13.54

### Ratio Analyzer



$\Delta_{38\text{Hz}} = 0.852\%$ . Fault Detected in X2 Winding (Phase B)

## Graphic Results of Magnitude Ratio



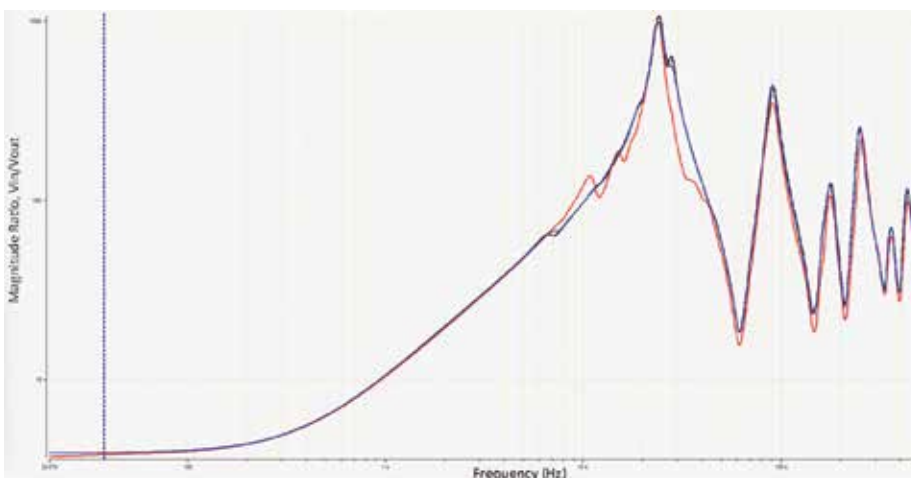
**Figure 4:** Unit 3, YNd1, NP ratio = 13.54

## Ratio Analyzer

Plot Traces	Magnitude (ratio)	Pass/Fail	
H1-X1_2017-11-01_11	27.733	Pass	
H2-X2_2017-11-01_11	27.282	Pass	
H3-X3_2017-11-01_11	30.048	Fail	
Frequency	38.138 Hz		
Average	Max Δ	Max % Δ	
28.354	2.766	9.755	
H3-X3_2017-11-01_11-45-09 has the highest ratio: shorted turns in winding connected to Black Lead-RMg31			
Test Parameters			
Parameter Name	Nominal	Inputs	
Ratio Accuracy (%)	0.5	0.500	%
Acceptance Threshold	0	0.000	%Δ
Low Frequency Ratio Point Presets			
<input type="checkbox"/> 25 Hz <input checked="" type="checkbox"/> 38 Hz <input type="checkbox"/> 78 Hz			

$\Delta_{38\text{Hz}} = 10.56\%$ . Fault Detected in X3 Winding (Phase C)

## Graphic Results of Magnitude Ratio



**Figure 5:** Unit 4, Dyn1, NP Ratio = 3.86

## Ratio Analyzer

Plot Traces	Magnitude (ratio)	Pass/Fail	
PHASE A RATIO	3.912	Pass	
PHASE B RATIO	3.819	Fail	
PHASE C RATIO	3.913	Pass	
Frequency	38.130 Hz		
Average	Max Δ	Max % Δ	
3.882	0.094	2.412	
PHASE B RATIO has the lowest ratio: shorted turns in winding connected to Red Lead-RMg22			
Test Parameters			
Parameter Name	Nominal	Inputs	
Ratio Accuracy (%)	0.5	0.500	%
Acceptance Threshold	0	0.000	%Δ
Low Frequency Ratio Point Presets			
<input type="checkbox"/> 25 Hz <input checked="" type="checkbox"/> 38 Hz <input type="checkbox"/> 78 Hz			

$\Delta_{38\text{Hz}} = 3.831\%$ . Fault Detected in H2 Winding (Phase B)

## CONCLUSION

This case study shows that the SFRA ratio test was successful in both tested transformers. It detected the presence of the shorted turns and identified the winding that was sheltering them. [NW](#)



**Long Pong** is a Senior Principal Engineer in the Doble Client Service Department. He has amassed over 30 years of experience in power utility and has published numerous technical papers on condition assessment, troubleshooting, and new test techniques for power electrical apparatus. Before joining Doble in 2000, he was employed at Alcan-Énergie Électrique and Hydro-Québec. Pong is an IEEE member and a registered Professional Engineer in North Carolina. He earned a BS in electrical engineering from École Polytechnique de Montréal, Quebec, Canada.

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When uptime is critical, uncertainty is not an option. Power systems are becoming more complex, expectations for performance continue to rise, and even minor disruptions can create significant operational and safety risk. In high-demand environments, reliability depends on expertise, speed, and clear accountability before issues escalate.

# MEGGER:

## MEETING THE CHALLENGES OF CHANGE

NETA Corporate Alliance Partners (CAPs) are industry-leading companies that have joined forces with NETA to work together toward a common aim: improving quality, safety, and electrical system reliability.

In this continuing series highlighting NETA's CAPs, the 2026 *NETA World* Corporate Alliance Corner will feature articles authored by leaders of NETA's CAPs. Each article will provide a "View from the Bridge," a perspective on what the CAP company sees as the important changes and key implications taking place in their industry segment of the electrical power industry.



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Here, we visit with Sha Farhang, PE, a Senior Applications Engineer in Megger's Technical Support Group (TSG).

**NW:** What are the important changes you are seeing in your industry segment?

**Farhang:** One of the most important changes in the power industry maintenance segment is the shift from timebased maintenance to conditionbased and predictive maintenance. Asset owners are under increasing pressure to improve the reliability and resilience of the grid, which requires earlier detection of problems and better use of available data rather than relying solely on fixed maintenance intervals.

At the same time, adoption of online monitoring technologies is growing, including IoT sensors and advanced data analytics. These technologies provide continuous visibility into asset condition, allowing utilities and service providers to identify emerging issues earlier, reduce unplanned outages, and make more informed maintenance decisions.



Another key change is the increasing demand for software integration. Customers now expect monitoring systems, maintenance platforms, and reporting tools to work together, enabling faster decisionmaking, better coordination of field work, and more efficient execution of maintenance activities.

**NW:** What factors are driving these changes?

**Farhang:** The power industry is changing due to several strong external pressures. Electrification in everyday life, the rapid growth of data centers, and increasingly severe weather events are all driving the need for higher reliability and resilience. At the same time, utilities are expected to deliver more stable power while managing aging infrastructure and growing demand.

In parallel, advanced technologies are becoming more mature, accessible, and cost-effective. Solutions such as online monitoring, IoT sensors, analytics software, and cloud-based platforms are now practical tools for improving grid performance. These technologies are no longer experimental—they are becoming standard options to address operational challenges.

The combination of rising outage costs and decreasing technology costs is a key driver of change. As the grid expands and becomes more complex, the impact of unplanned outages is increasing, while the cost of deploying advanced monitoring and data-driven solutions continues to decline. Together, these trends are creating a strong push toward modernization and may lead to a super-cycle of investment and innovation in the power industry.

**NW:** How is your organization responding to the changes?

**Farhang:** We operate in the field of developing and manufacturing electrical testing and monitoring solutions for the power industry, and our response has been to expand beyond traditional testing into more integrated, data-driven approaches. While off-line and conventional testing methods remain a core part of our business, we are increasingly focusing on continuous monitoring solutions that provide real-time visibility into asset condition. This includes combining technologies such as DGA, partial discharge, and grid monitoring into unified platforms that support condition-based maintenance and improve overall system reliability.

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Megger has also made significant investments in digital capabilities. This includes advanced analytics, cloud integration, and user-friendly software designed to transform raw data into actionable insights. Today's customers expect more than just measurement—they need clear diagnostics, early warnings, and decision support tools.

Megger has strengthened its capabilities through investments and acquisitions in DGA monitoring (Weidmann Labs), partial discharge (Power Diagnostix—PDIX in Germany), and software and cloud solutions (Intelligent Process Solutions—IPS), along with further expansion in grid monitoring technologies such as MGA and Sentriseense.

In addition to development and production, we are also advancing our service and support capabilities by leveraging new technologies. Supporting monitoring solutions requires a different approach than traditional testing, so we are continuously

strengthening our technical support organization. This includes expanding training, remote support, site support, and service-based offerings. In a rapidly evolving grid environment, success depends on helping customers improve reliability while reducing operational complexity and cost.

**NW:** How will these changes impact the overall electrical power industry?

**Farhang:** These changes are to improve system reliability and resilience while enabling more cost-effective and scalable operations. The increased use of IoT devices, sensors, and online monitoring—combined with traditional testing and OEM data—will generate large volumes of data. This will require advanced data storage and analytics systems, but it will also provide much better visibility into asset conditions and system performance.

As a result, decision-making will become more data-driven and proactive. Utilities will

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move toward smarter planning and risk-based maintenance strategies, with better insight into asset health and potential failures. This increased visibility may also influence related areas such as insurance, where improved understanding of risk could impact assessment and pricing models.

From a standards and regulatory perspective, the industry is likely to shift from static thresholds and pass/fail criteria toward more dynamic, data-driven approaches. At the same time, the growing reliance on digital systems will make cybersecurity and reliable communication infrastructure critical priorities for the power industry.

**NW:** How do these changes affect the electrical testing industry?

**Farhang:** The electrical testing industry has already begun adapting to these changes, evolving from pure measurement toward diagnostics and decision support. For example,

ANSI/NETA MTS guidelines promote risk-based maintenance by considering both asset criticality and condition to suggest maintenance intervals. I believe the key shift is toward new digital tools, integrated data, and more real-time assessment.

Testing data is increasingly integrated with monitoring systems, analytics platforms, and OEM information to provide a more complete view of asset health. This requires testing solutions to be more connected and capable of operating within digital ecosystems such as cloud platforms.

Testing professionals will need to understand traditional methods as well as modern digital technologies. Documentation is becoming more digital, with real-time data validation and assessment playing an important role during maintenance activities. This ensures data accuracy, improves decision-making in the field, and may require service companies to adapt their business models accordingly. **NW**



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# PowerTalk Stage: AI LEARNING IN THE POWER INDUSTRY

EPIC26 convenes this October in Fort Worth, Texas, bringing together leading organizations, industry experts, and power professionals to explore the trends shaping the electrical power landscape over the next 5, 10, and 20 years. With a focus on strengthening resiliency, advancing safety, and preparing for a rapidly evolving grid, the conference offers a forward-looking forum for insight and innovation.

Artificial intelligence has moved decisively into the mainstream of the power industry. Once viewed as a future-leaning experiment, AI is now a practical tool reshaping how companies plan, operate, and maintain electrical infrastructure. With rising demand for power, increasing system complexity, and a constrained workforce, organizations are turning to AI to scale expertise, accelerate decision-making, and improve reliability. The industry is entering a period where thoughtful AI adoption is becoming essential to staying competitive and meeting the expectations of modern power consumers.

## **AI AS AN OPERATIONAL ACCELERATOR**

Across the sector, AI is already delivering measurable improvements in efficiency and productivity. Companies are applying AI to quoting, scheduling, dispatching, and reporting, reducing administrative burdens and enabling smaller teams to accomplish more. These tools streamline workflows, minimize delays, and support more consistent service delivery.

AI-powered knowledge systems are transforming field troubleshooting. By consolidating

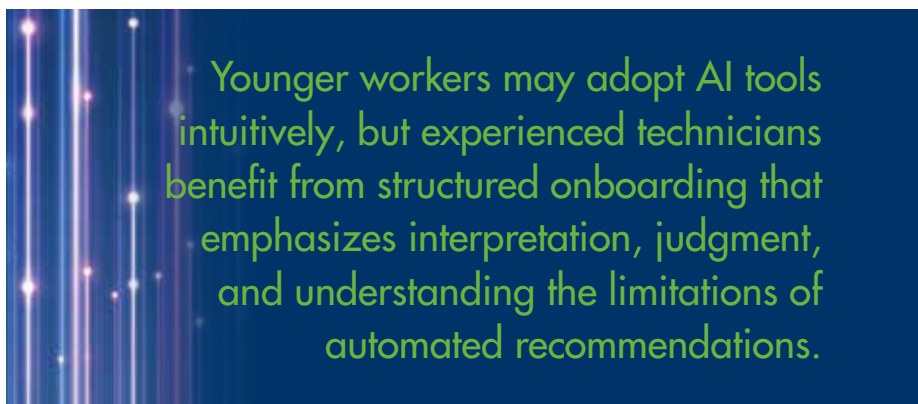


*This article is a collection of excerpts from the PowerTalk Stage AI and Cybersecurity Panel Discussion at PowerTest25.*

institutional manuals, historical failures, and best practices into instantly accessible information, technicians can diagnose issues faster and arrive on-site better prepared. Route optimization tools reduce travel time and fuel use, while automated reporting cuts hours of manual documentation. By shifting repetitive, low-value tasks to AI systems, organizations free technicians and engineers to focus on higher-value work—an essential advantage in a labor-constrained environment.

## KNOWLEDGE CAPTURE, WORKFORCE EMPOWERMENT, AND TRAINING

AI is emerging as a powerful mechanism for capturing and distributing institutional knowledge. As experienced technicians retire, AI systems help preserve decades of expertise, making it accessible to apprentices and junior engineers. Machine learning models can identify patterns—such as partial discharge



signatures or transformer degradation indicators—that traditionally required long-term field experience to recognize.

At the same time, workforce development remains critical. Younger workers may adopt AI tools intuitively, but experienced technicians benefit from structured onboarding that emphasizes interpretation, judgment, and

Register for  
EPIC26 today at  
[epicpower.org](http://epicpower.org).

understanding the limitations of automated recommendations. High-quality data, contextual awareness, and human oversight remain essential to ensuring AI outputs are accurate and actionable.

AI is also reshaping the skill profiles of field roles. Networking, communications, and cybersecurity competencies are becoming increasingly important as digital and electrical power systems converge. The technician of the future will be as comfortable navigating digital platforms as electrical schematics.

### **SAFETY, RISK MANAGEMENT, AND CYBERSECURITY**

Safety remains the industry's foundational priority, and AI must be integrated in ways that reinforce—not replace—human accountability. AI can support decision-making, but it cannot assume responsibility for safety-critical actions. Over-reliance on automated recommendations can lead to skill degradation, misinterpretation of outputs, and unsafe decisions. Human verification and traditional skills remain essential safeguards.

assessments help determine where AI can be safely applied and where tighter controls are required.

### **AUTONOMY, ACCESS, AND GOVERNANCE**

While AI can analyze, classify, and recommend, full autonomy is not appropriate for most power applications today. Human-in-the-loop governance remains essential. AI tools should support decision-making, not replace it.

Access to data must be granular, not universal. Tools such as Microsoft Copilot and other AI-driven platforms can be highly effective for internal analysis, but only when paired with clear data classification and human judgment. Governance frameworks must ensure transparency, traceability, and accountability in how AI recommendations are generated and used.

### **CUSTOMER EXPERIENCE AND BUSINESS IMPACT**

AI is also reshaping the customer experience. Automated specification reading and proposal summarization free engineers to focus on solution quality rather than administrative tasks. Improved data analysis leads to clearer, more actionable recommendations for customers.

Transparency remains essential. Customers must understand how AI-informed decisions are made, and organizations must communicate clearly about how AI supports—not replaces—the engineering process. When used effectively, AI enhances both service quality and customer trust.

### **FUTURE OUTLOOK: THE NEXT 5 TO 10 YEARS**

AI adoption in the power industry is expected to accelerate rapidly in the coming decade. Several trends are likely to shape the future:

- Remote monitoring and predictive maintenance will reduce emergency service calls and enable more proactive asset management.

AI is also reshaping the customer experience. Automated specification reading and proposal summarization free engineers to focus on solution quality rather than administrative tasks.

Cybersecurity considerations are equally important. As systems become more connected, the attack surface expands. AI can strengthen defenses by detecting anomalies and analyzing large datasets, but adversaries are also leveraging AI to increase the sophistication of their attacks. Tiered, role-based access to data and systems is essential, along with governance frameworks that ensure AI tools operate within clearly defined boundaries. Criticality

- Centralized monitoring hubs will oversee larger geographic areas, supported by AI-driven analytics.
- Technicians will require higher-level digital skills, particularly in interpreting AI insights and managing interconnected systems.
- Innovation cycles will shorten, with tiered AI adoption ranging from basic automation to advanced predictive modeling.

These developments will fundamentally reshape how power systems are designed, monitored, and maintained. Organizations that invest in AI readiness—technologically and culturally—will be best positioned to navigate this transformation.

## CONCLUSION

AI is transforming the electrical power industry, offering unprecedented opportunities to scale expertise, improve efficiency, and

strengthen reliability. Its success, however, depends on thoughtful integration, disciplined governance, and a steadfast commitment to human oversight. Organizations that treat AI as a partner—rather than a replacement—will be best equipped to meet rising demands while preserving the safety, reliability, and craftsmanship that define the profession.

By combining the strengths of human judgment with the speed and scale of AI, the industry can move confidently into a future defined by innovation, resilience, and smarter power systems. [NW](#)

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# MAINTENANCE AND MANAGEMENT: CARIBBEAN AND LATIN AMERICA ELECTRICAL POWER SYSTEMS

BY KEN PETERSON, *Quanta Services*

For electrical testing and maintenance professionals, international work is never simply a matter of exporting a North American maintenance program to a new region. The core principles remain the same—safety, reliability, documentation, and disciplined testing—but the operating environment changes everything. That is especially true in the Caribbean and Latin America.

From a Quanta Services perspective, these two markets matter because they combine growing infrastructure needs with very different grid realities: islanded systems, hurricane exposure, aging thermal generation, expanding renewable portfolios, long transmission corridors, mining and industrial loads, and diverse regulatory frameworks. The result is a maintenance challenge that is both technical and operational.

Quanta Services has had a meaningful presence that supports this view. Quanta Services has experience in the Latin America platform serving Chile, Colombia, Costa Rica, Guatemala, Mexico, Panama, and Peru. In Puerto Rico, Quanta Services has also been associated with operating, maintaining, and modernizing the island's transmission and distribution system.

Within the broader Quanta Services family, Power Engineering Services adds a NETA-accredited testing and commissioning perspective, providing acceptance testing, protective relay testing and calibration, and utility substation commissioning and maintenance. That combination of regional execution, supported by testing, engineering, commissioning, construction, and lifecycle services, makes a practical Quanta Services perspective possible.

## THE CARIBBEAN

The Caribbean presents perhaps the clearest example of why maintenance strategy must be shaped by local conditions. Many Caribbean systems are small and isolated, with limited interconnection to neighboring grids. In



*Night View of Havana, Cuba*

practice, that means operators have less room for error. Generation outages, relay misoperations, delayed spare parts, or storm damage that might be absorbed elsewhere can quickly become system-level events on an island grid.

The region also remains heavily dependent on imported petroleum products, with aging diesel-based infrastructure still playing an outsized role in electricity supply. Those conditions create high power costs and constant pressure on utilities and private operators to keep aging assets in service while also integrating cleaner and more resilient technologies.

For maintenance professionals, that Caribbean profile shifts the emphasis from simple periodic testing toward disciplined, risk-based asset management. A reliability-centered program in this environment starts with the fundamentals: accurate equipment inventories, baseline acceptance and maintenance test data, relay and control verification, infrared and visual inspections, insulation assessment, breaker and transformer condition evaluation, and clear maintenance intervals tied to duty, age, and consequence of failure. The logic is consistent with ANSI and NETA maintenance testing principles, which focus on verifying that equipment is operational, within applicable tolerances, and suitable for continued service. It

also aligns with the broader NETA philosophy that the ideal maintenance program is reliability-based and unique to each plant and piece of equipment.



*Completion of Commissioning of Power Transformer in Puerto Rico*



*Line Work in the Caribbean*

In the Caribbean, however, that framework must also account for marine and tropical realities. Salt contamination, humidity, corrosion, heat, and windborne debris can accelerate degradation in switchgear, substations, line hardware, and protective equipment. Hurricane exposure raises the stakes even further. The widespread collapse of Puerto Rico's transmission and distribution system after Hurricanes Irma and Maria demonstrated how quickly a grid can move from stressed operation to catastrophic failure. From a maintenance and management standpoint, that means storm preparation cannot be treated as a seasonal checklist alone. It must include hardening priorities, vegetation management, spare parts strategy, emergency switching plans, black start readiness, restoration sequencing, contractor mobilization, and post-event damage assessment protocols that are practiced before the storm arrives.

This is where Quanta Services' relevance in the Caribbean becomes concrete. The Quanta Services and ATCO-led LUMA joint venture was selected to operate, maintain, and modernize Puerto Rico's transmission and distribution system. Whatever the political debate around utility reform, the maintenance lesson is straightforward. Island system reliability is inseparable from long-term asset management. Operators need current asset condition data, credible work packaging, disciplined outage planning, and the ability to move from deferred maintenance to structured renewal. For a NETA audience, the key point is that testing is not a standalone event. It is the evidence base that allows operators to prioritize limited capital and maintenance resources where they matter most.

## LATIN AMERICA

Latin America presents a different, though equally demanding, maintenance landscape. Unlike the Caribbean's small isolated systems, Latin America includes large continental grids, major industrial corridors, extensive transmission networks, and a wide mix of generation assets. The region's energy transition is also further advanced in several respects.



*Santiago, Chile, Grid*

Clean energy investment across Latin America and the Caribbean continues to expand, while renewable electricity grows alongside increased grid investment in modernization, storage, and flexibility. For maintenance managers, that means the installed base is becoming more diverse, not less. Hydroelectric, gas, and legacy thermal assets continue to operate even as wind, solar, battery systems, and new substations are added to the system.

That diversity creates two parallel maintenance responsibilities. The first is to preserve the performance of incumbent infrastructure that still carries the bulk of real-time system responsibility. In much of Latin America, hydroelectric generation remains central to system stability, but severe weather events and changing climate patterns can damage hydroelectric assets and disrupt supply. Thermal plants, meanwhile, often remain essential for reserve margins, system support, or industrial self-generation. These assets require disciplined outage management, protection system testing, balanced plant maintenance, and condition-based interventions to extend useful life without accepting hidden reliability risk.

CLEAN ENERGY INVESTMENT ACROSS LATIN AMERICA AND THE CARIBBEAN CONTINUES TO EXPAND, WHILE RENEWABLE ELECTRICITY GROWS ALONGSIDE INCREASED GRID INVESTMENT IN MODERNIZATION, STORAGE, AND FLEXIBILITY.



*Substation Construction in Puerto Rico*



*Solar Farm in Limeira City, São Paulo, Brazil*

**REMOTE ACCESS, ALTITUDE, HEAT, RAINFALL, LOGISTICS, CUSTOMS, PERMITTING, AND LOCAL LABOR CAPABILITY CAN ALL SHAPE OUTAGE WINDOWS AND WORK PACKAGING AS MUCH AS THE TECHNICAL SCOPE ITSELF.**

The second responsibility is to commission and manage a newer class of assets whose maintenance philosophy is still evolving in many markets. Solar plants, wind plants, battery systems, digital substation equipment, and inverter-based resources bring different failure modes, monitoring needs, and protection challenges. As renewable penetration increases, the maintenance conversation broadens from equipment condition alone to system behavior, voltage regulation, fault-current response, protection coordination, communications reliability, control system cybersecurity, and the performance of interfaces between generation, substations, and transmission infrastructure. In that setting, acceptance testing and commissioning are not merely project closeout activities. They establish the baseline data, settings discipline, and documentation quality that determine whether long-term maintenance will be effective or reactive.

Latin America also places a premium on local execution. The regional opportunity is real in Chile, Colombia, Costa Rica, Guatemala, Mexico, Panama, and Peru, but there is no single Latin American maintenance model. Mining-driven systems in the Andes, industrial loads in Mexico, urban utility systems in Central America, and renewable corridors in Chile each demand different maintenance priorities. Remote access, altitude, heat, rainfall, logistics, customs, permitting, and local labor capability can all shape outage windows and work packaging as much as the technical scope itself. In other words, good maintenance management in Latin America requires the same thing NETA standards demand everywhere: objective test results and disciplined procedures, combined with local operating knowledge.

**INTEGRATION IS KEY**

From a Quanta Services standpoint, the most durable lesson across both regions is that electrical power maintenance works best when it is integrated rather than fragmented. Quanta Services capabilities include transmission and substation construction and maintenance, emergency restoration, asset management, testing and commissioning, system planning studies, and closeout and commissioning

support. That matters because asset reliability is rarely improved by testing, construction, or engineering alone. It improves when those functions are linked. A transformer test that identifies deterioration has greater value when engineering can assess system impact, operations can plan the outage, supply chain teams can source materials, and field crews can execute repair or replacement safely and quickly.

For that reason, the strongest maintenance programs in the Caribbean and Latin America are likely to share a common structure.

- First, they establish an asset baseline through acceptance testing, documentation review, relay file validation, and field condition assessment.
- Second, they rank assets by criticality and consequence of failure rather than by calendar alone.
- Third, they blend preventive, predictive, and corrective maintenance instead of relying exclusively on any one model.
- Fourth, they align maintenance with resilience goals, including storm hardening, spare equipment strategy, and restoration readiness.
- Finally, they use every outage as a data opportunity, improving future work scopes through test results, failure analysis, and lessons learned.

## MOVING FORWARD

That approach is also well-suited to the region's future trajectory. The Caribbean is moving toward cleaner, more resilient, and more affordable energy systems, but it still faces high electricity prices, imported fuel dependence, and aging infrastructure. Latin America continues to attract investment in renewables, grids, and industrial development, but it must manage that growth while preserving reliability on mixed generation systems. In both cases, maintenance and management are no longer back-office functions. They are strategic

disciplines that determine whether capital investment actually delivers resilience, safety, and availability.

For Quanta Services companies and NETA-certified professionals, that is the opportunity. The value is not simply in performing tests or completing maintenance tasks, but in helping owners translate technical data into operating decisions. In the Caribbean, that may mean prioritizing the substation, feeder, generation, or spare-parts risks that most affect restoration time after a storm. In Latin America, it may mean building maintenance programs that support renewable integration without neglecting hydroelectric, thermal, or industrial backbone assets. In either market, the central objective is the same: creating electrical power systems that are not only functional today, but also maintainable, resilient, and manageable over their full life cycle.

## CONCLUSION

The international feature of this discussion is important, but the underlying principle is universal. Power systems do not become reliable because they are new, nor because they are ambitious, nor because they include renewable technology. They become reliable when owners apply disciplined standards, generate trustworthy field data, respect local operating conditions, and act on maintenance findings before those findings become failures.

That is the most useful Quanta Services perspective for the Caribbean and Latin America. Reliability is built in the field, proven by testing, and sustained by management. [NW](#)



*Ken Peterson is Vice President of Operations at Power Engineering Services, a NETA-Accredited electrical testing and commissioning firm and a Quanta Services company. He holds NETA Level IV Senior Technician certification and has more than 35 years of experience in electrical power system maintenance, testing, and commissioning.*



————— No. 152 —————  
*A N S W E R S*

1. **b. Single-Line Diagram.** This engineering document shows how electrical energy travels through the electrical system. Attention must be paid to ensure the equipment's labeling exactly matches the single-line drawing. This verifies that all sources of electrical energy can be properly isolated.
2. **d. Apply temporary protective grounds.** All of the preceding steps ensure the equipment is free of potential energy, locked in that state, and tested with an appropriate meter to verify. At this point, applying grounds ensures no voltage can exist between the de-energized parts and the rest of the grounding system.
3. **b. Identify it with appropriate alerting techniques.** It is common to have partial outages that result in energized equipment in the area. Take the time to indicate this equipment with red flagging, barricades, or a posted attendant to remind others not to enter, especially when similar-looking equipment is part of the isolation.
4. **d. All of the above.** One example is testing the A side of a main-tie-main switchgear. Red flagging must be applied to any sections containing voltage (such as the tie breaker cell), and the crew must be informed that nobody should enter that equipment. Workers are subject to human error, and flagging proactively creates a physical barrier that makes it more difficult to make those mistakes.
5. **b. Test for the presence of voltage.** The hazards associated with live electrical equipment are considered high-severity. Humans cannot sense voltage, and using an appropriate voltage detector gives you one more chance to catch a severe hazard before it is too late.
6. **c. All of the above.** When sending voltage and current into the relay from a test set, wiring must be controlled locally so that other workers do not make contact. Similarly, we must avoid energizing any field wiring unless it is isolated or controlled, and associated breakers must be isolated to avoid unexpected operation. If potential transformers (PT) are not isolated, large primary voltages can be generated by backfeeding through PT secondary terminals.
7. **d. All of the above.** Isolation points can fail, an outdated drawing could be incorrectly referenced, or temporary voltage could be applied from a generator. Carefully following all steps up to and including testing for voltage every time gives us the best chance to work safely around electrical equipment. [NW](#)



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The logo for EPIC 26 features the letters 'E', 'P', and 'I' in a large, white, sans-serif font. The letter 'C' is a large white circle containing the number '26' in a bold, green, sans-serif font. To the right of the 'C' is the text 'Electrical Power Innovations Conference' in a white, sans-serif font, stacked in four lines. The background is a dark blue city skyline at night with vertical light trails in shades of blue and purple.

# EPIC 26

Electrical  
Power  
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## WHERE INDUSTRY LEADERS SHAPE THE FUTURE OF POWER

*Hosted by NETA*

For decades, the electrical power industry moved at a measured pace—today, it is accelerating at an unprecedented rate. Surging power demand, intensifying service expectations, digital transformation, and workforce constraints are converging at once. For company leaders and organizational strategists, the question is no longer whether change is coming, but how fast—and whether your business will lead or follow.

That is why EPIC26—the Electrical Power Innovations Conference hosted by NETA—is an essential event for executives, senior managers, and forward-thinking strategists committed to growth, resilience, and longterm success.

## FROM TECHNICAL CONFERENCE TO STRATEGIC IMPERATIVE

EPIC26 goes beyond traditional technical education. It is a leadership-level forum focused on professional development and organizational strategy in a rapidly reshaping power landscape. The conference is designed to help decision-makers translate industry change into competitive advantage through smarter planning, stronger partnerships, and more agile execution.

### EPIC26 helps leaders:

- Plan for professional and organizational success.
- Capitalize on accelerating power and service demand.
- Align investment with future-ready technology and workforce strategies.
- Collaborate across sectors to stay ahead of the curve.

This is not about keeping up. It's about staying out front—on the crest of the industry's next major growth wave.

## UNDERSTANDING THE FORCES RESHAPING POWER SYSTEMS

Electrification, large electronic loads, distributed energy resources, and inverter-based technologies are fundamentally altering how power systems are planned, operated, and maintained. At the same time, customers expect near-perfect reliability, seamless communication, and environmental stewardship—placing unprecedented pressure on utilities, service providers, and manufacturers alike.

EPIC26 brings clarity to these challenges by connecting leaders directly with peers and experts who are navigating them in real time.

## Why Company Leaders and Strategists Must Attend EPIC26

EPIC26 is designed to help decision-makers translate industry change into competitive advantage through smarter planning, stronger partnerships, and more agile execution.

Sessions focus not only on technology, but also on strategic response: how to align operations, capital planning, and workforce development with what's coming next.

## BUILT FOR COLLABORATION FROM FIRST INSIGHT TO LASTING IMPACT

The experience begins with compelling keynote speakers who set the strategic tone, followed by 60-minute presentations focused on the issues most pressing to today's leaders in an evolving power landscape.

Those sessions transition into interactive symposium panels, creating a think-tank environment where experts and attendees engage in open dialogue. The conference culminates in hands-on workshops designed to connect ideas with action: mapping projects, forming partnerships, and developing solutions that continue long after EPIC26 concludes.

## COLLABORATION THAT DRIVES COMPETITIVE ADVANTAGE

*Registration is open—but thought-leadership seats are limited. EPIC26 convenes industry leaders to collaborate, challenge assumptions, and cocreate strategies shaping the future of electrical power. Visit [EPICpower.org](http://EPICpower.org).*

Leaders engage directly with innovators and decision-makers from utilities, engineering firms, manufacturers, service providers, and governing bodies.

# EPIC CONFERENCE

## KEYNOTE INSIGHTS THAT MATTER TO DECISION-MAKERS

EPIC26's keynote speakers deliver perspectives uniquely relevant to senior leadership.

### Powering Progress: Past Lessons, Present Realities, Future Solutions

**Mark Carpenter,**  
Senior Vice President of  
Transmission & Distribution  
Operations, Oncor

Drawing on ERCOT Specific experience, Carpenter explores how outdated planning assumptions are giving way to automation, advanced analytics, digital twins, and condition-based maintenance—offering leaders a practical roadmap for balancing growth, reliability, and workforce constraints.



### Cybersecurity, AI, and IoT: Catalysts for Industry Evolution

**Hector Perez,**  
Head of Strategy, Global Industrial  
Cybersecurity, Black & Veatch

Perez examines why cybersecurity and digital transformation are now board-level issues, and how executive engagement is essential to unlocking AI-driven insight while protecting critical infrastructure.



### Power Supply Chains and Building Better Systems

**David Speidelsbach,**  
Vice President Sales & Strategic  
Initiatives, Electrical Power, Wesco

Speidelsbach offers a strategic look at supply chain resilience, partnerships, and system-wide thinking—critical for leaders steering organizations through expansion and modernization.



Collaborators include industry leaders such as Black & Veatch, Eaton, GE Vernova, Schneider Electric, Siemens, and ONCOR, along with leading NETA-accredited companies and respected authorities: the U.S. Departments of Labor and Energy, Hartford Steam Boiler (HSB), NERC, NFPA, and Rosendin, among others.

This diverse mix of perspectives enables focused, outcome-driven dialogue on reliability, safety, cyber and physical risk, workforce readiness, regulatory alignment, and system modernization—leading to partnerships and strategies that deliver lasting value. At EPIC26, collaboration is part of creating a competitive advantage.

## AN INVESTMENT IN LEADERSHIP AND GROWTH

For company leaders and organizational strategists, EPIC26 is more than an event—it is a strategic investment in relevance, resilience, and sustained growth. Those shaping the future of electrical power won't be watching from the sidelines. They'll be leading the EPIC conversation and helping define what comes next for their organizations and the industry. [NW](#)

### EPIC26 Invitation to Thought Leaders

EPIC26 brings industry leaders together to shape the future of electrical power. Collaborate with experts from Black & Veatch, GE Vernova, Siemens, ONCOR, and leading NETA Accredited Companies, alongside authorities such as the U.S. Department of Labor and Energy, Hartford Steam Boiler (HSB), NERC, and NFPA. Join working conversations that turn insight into strategy and collaboration into business advantages.

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# 26

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*Keynote Speaker Dan Shaffer*

# POWERTEST<sup>®</sup> 26

CONFERENCE

## SETS A NEW BENCHMARK FOR ELECTRICAL POWER SAFETY AND RELIABILITY

PowerTest26 concluded as one of the most successful and impactful conferences in the event's history, welcoming more than 1,500 attendees and 103 exhibitors to Nashville, Tennessee. Hosted at the Gaylord Opryland Resort & Convention Center, the five-day event once again affirmed PowerTest's position as the premier electrical power safety and reliability conference for technicians, engineers, project managers, sales professionals, and industry leaders.



From the opening keynote to the final technical sessions, PowerTest26 delivered on its mission to strengthen the electrical power service industry through advanced technical training, practical troubleshooting insight, and forward-looking strategies that improve safety, reliability, and organizational performance.

With more than 80 training sessions, expanded in-depth seminars, hands-on learning opportunities, and a dynamic trade show environment, the conference proved to be both a technical powerhouse and a catalyst for professional growth.

## **BUILT ON SAFETY, RELIABILITY, AND WORKFORCE ADVANCEMENT**

At its core, PowerTest26 tackled the most critical challenges confronting today's electrical power service organizations, from technician education and professional advancement to

workforce development, worker safety, system reliability, and operational productivity.

The conference agenda was carefully designed to deliver practical solutions, blending technical instruction with real-world case studies and leadership development.

Electrical safety remained the foundation of the entire event. Dedicated safety tracks, immersive experiences, and expert-led discussions reinforced the idea that safety is not a single procedure but a culture—one that must be continuously trained, evaluated, and strengthened. From arc flash hazards and NFPA compliance to stop-work authority and job-briefing best practices, attendees walked away with actionable insights they could apply immediately in the field.

Equally important was the conference's emphasis on technician advancement and recognition. Through continuing education

opportunities, exam preparation, and formal recognition events, PowerTest26 demonstrated a strong commitment to elevating the profession while helping companies invest meaningfully in their people.

### DEEP TECHNICAL TRAINING FOR ELECTRICAL TESTING PROFESSIONALS

One of the defining strengths of PowerTest26 was the depth and breadth of its technical training, which spanned every major discipline in electrical testing and system maintenance. Attendees customized their learning experience by selecting from targeted 45-minute sessions, panel discussions, and expanded four-hour seminars offered across multiple days.

Training tracks covered essential topics, including transformers, relays, circuit breakers, cables, protective systems, renewable energy, and evolving industry standards. Sessions were designed to support both foundational learning and advanced diagnostics, ensuring value for professionals at every stage of their careers.

### ELECTRICAL TESTING, SYSTEM MAINTENANCE, AND TROUBLESHOOTING EXCELLENCE

PowerTest26 placed strong emphasis on electrical testing and system maintenance theory, effective troubleshooting techniques, and best practices essential to accurate testing and long-term reliability.

Presenters included seasoned field experts, engineers, and manufacturer specialists who delivered instruction grounded in real-world experience.

- **Transformer** sessions explored subjects such as sweep frequency response analysis (SFRA), power factor testing, dielectric frequency response, and online and offline monitoring.
- **Relay and protection** training moved beyond theory into field-proven application, equipping attendees with practical methods for commissioning,

troubleshooting, and validating protection schemes.

- **Cable testing** sessions examined evolving diagnostic methods, fault-locating technologies, and the challenges technicians face in modern systems, including renewable and battery energy storage installations.

Across all equipment types, the focus remained on disciplined testing practices, informed analysis, and condition-based decision-making.

### Real-World Case Studies and Practical Insights

PowerTest26 distinguished itself by going beyond textbook instruction. Many sessions centered on real-world troubleshooting scenarios and in-depth case studies, allowing attendees to learn directly from field challenges.

Presenters shared lessons from equipment failures, nearmiss incidents, and complex commissioning projects—breaking down how issues were identified, tested, and resolved. These discussions reinforced an essential truth for technicians and engineers alike: effective troubleshooting depends not only on quality test equipment, but also on experience, situational awareness, and a deep understanding of system behavior.

### Professional Development, Leadership, and Business Growth

In addition to technical education, PowerTest26 dedicated significant focus to professional development, recognizing that the industry's future depends on strong leadership and organizational alignment. Dedicated tracks in sales, business management, and workforce development addressed challenges such as motivating skilled technicians to level up, retaining experienced professionals, improving job satisfaction, and building sustainable career pathways.

Sessions explored strategies for creating winning company cultures, aligning field execution with business objectives, and developing the next generation of industry leaders. For sales

# NETA PowerTalk



professionals and managers, courses provided insight into relationship-based selling, understanding customer reliability priorities, and differentiating technical expertise in a competitive marketplace.

## **Certification, Exam Preparation, and Continuing Education**

PowerTest26 provided exceptional opportunities for certification preparation and continuing education, allowing attendees to earn up to 48 NETA Continuing Technical Development (CTD) credits or 4.8 CEUs.

NETA Technician Certification exam preparation and NFPA 70B Qualified Electrical Equipment Maintenance Worker (QEMW) training were among the most popular offerings. These sessions supported early-career technicians building competency and experienced professionals seeking to validate and advance their expertise through recognized credentials.

## **TRADE SHOW INNOVATION AND INDUSTRY COLLABORATION**

The PowerTest26 Trade Show served as a center of innovation and collaboration, featuring 103 exhibitors representing leading manufacturers, service providers, and technology developers. Attendees explored the latest test equipment, monitoring solutions, safety products, software platforms, and maintenance tools through hands-on demonstrations and technical discussions.



The New Product Forum and PowerTalk Stage added further value, showcasing emerging technologies, digital transformation trends, artificial intelligence, IoT applications, and renewable energy integration—highlighting the future direction of electrical testing and maintenance.

## **COMMUNITY, NETWORKING, AND SIGNATURE EVENTS**

Beyond training and technology, PowerTest26 celebrated the people who power the industry. The Technician Level Up Recognition Reception honored the skill, dedication, and professionalism of electrical testing technicians, reinforcing the importance of recognizing excellence in a demanding field.

Evening networking events and social experiences created memorable opportunities for connection, highlighted by the conference's



most popular Hospitality Suite Night, featuring 10 uniquely themed suites and a central gathering PowerBar that brought peers, customers, mentors, and partners together in a lively, engaging atmosphere.

The sense of community continued at PowerBash hosted by A-Rent, where PowerTest attendees gathered for a country music concert to remember, headlined by Graham Barham, a rising country music favorite. Together, these moments fostered collaboration, strengthened industry relationships, and reinforced that PowerTest is as much about community and connection as it is about education.

### THANK YOU TO OUR POWERTEST26 CONTRIBUTORS

PowerTest26 would not have been possible without the dedication and support of our speakers, sponsors, and exhibitors. Their expertise, innovation, and commitment to advancing electrical power safety and reliability made this exceptional gathering a success. We extend our sincere appreciation to each presenter who shared their knowledge, every sponsor that invested and

elevated the experience, and all exhibitors who helped create an unmatched environment for learning, professional development, and business growth.

### LOOKING AHEAD

As PowerTest26 wrapped up, attendees headed home energized, better prepared, more confident, and more connected—and the excitement is just getting started.

Looking ahead, PowerTest27—scheduled for March 8–12, 2027—brings the industry back to the Rosen Shingle Creek Resort in sunny Orlando, Florida, for an even more immersive and memorable experience. With all-new technical session content, expanded networking and engagement opportunities, and a few exciting surprises in store, PowerTest27 is set to raise the bar once again.

Mark your calendars and plan to be there. PowerTest27 is one you won't want to miss.

# ANNUAL MEMBER AND ALLIANCE MEETING HIGHLIGHTS

NETA held its Annual Member and Alliance Meeting on March 1, 2026, marking the official kickoff to PowerTest26, the Association's premier technical conference. The annual meeting brings together NETA Members and Alliance Partners to review progress, conduct association business, and recognize the individuals and companies that help advance NETA's mission of safety, quality, and independent electrical power system testing.

## NEW NETA ACCREDITED COMPANIES

A highlight of this year's meeting was the formal welcome of two newly accredited companies into the NETA Accredited Company (NAC) program: EnerPhase Solutions Ltd. of Calgary, Alberta, accredited in January 2026, and Skagit Electric of Burlington, Washington, accredited in February 2026. Their accreditation reflects the continued growth of the NAC community and NETA's expanding reach across North America.

## BOARD OF DIRECTORS NOMINATIONS

During the meeting, members nominated new Board of Directors candidates with terms ending May 31, 2029: Lorne Gara of Shermco Industries, Stephanie Patterson of Qualus Services, LLC, and Ken Peterson of Power Engineering Services, LLC. To maintain balanced board tenures, current board members Chasen Tedder of Hampton Tedder and Jim Cialdea of Sigma C Power Services were nominated for one-year renewal terms ending May 31, 2027.

Non-voting board member updates were provided for Dave Huffman of IPS PowerServe, David Kreger of Premier Power Maintenance, and Eric Beckman of IPS PowerServe. Members also elected the 2026–2027 slate of officers, with terms running from June 1, 2026, through May 31, 2027: President Dan Hook (CBS Field Services), 1st Vice President Chasen Tedder (Hampton Tedder Technical Services), 2nd Vice President Lorne Gara (Shermco

Industries), Treasurer Jim Cialdea (Sigma C Power Services), and Secretary Scott Blizard (Asplundh Electrical Testing, LLC).

## NETA PROGRAM UPDATE

Member and Alliance Partners received updates from numerous committees and programs, including Alliance Partnerships, Volunteers, Industry Awareness, *NETA World*, NAMO, the QEMC Program, Training, Standards Review Council, Technical Resources, Technical Exam, and Conference Committees.

NETA extended a special thank-you to Annual Meeting Keynote Speaker Chris Ferrell, CEO and Co-Founder of Endeavor Media, the leading power-industry trade publisher. Ferrell delivered an insightful overview of major themes in the U.S. economy and shared a high-level perspective on trending news topics impacting the electrical power testing industry.

## NETA ACCREDITED COMPANY VOLUNTEERS

One of the most important segments of the meeting was the recognition of NETA Accredited Company volunteers, who serve as the vital link between members and the Association in their roles as Accredited and Technical Representatives. Member Recognition Awards were presented to honor exceptional service:

- **Julie Dondero** of Electrical Reliability Services received the *Excellence in Service* award.
- **Evan Helwig** of 1 Test was named *Rookie of the Year*.
- **Kristen Schmidt** of USC Power Services earned *Rockstar Technician Representative*.
- **A.J. Borchers** of Power Solutions Group was honored as *Rockstar Accredited Company Representative*.

Together, these recognitions underscored the dedication and leadership that continue to strengthen NETA and its member community.



## POWERTEST26 AWARD WINNERS

NETA thanks all of its valued speakers, sponsors, and exhibitors for making PowerTest26 a great success and a rewarding experience for all.

PowerTest is first and foremost a technical training conference. But the event also serves to provide a forum for power professionals to

gather each year to reconnect, share information and ideas, and meet up with new and long-standing customers.

Each year, attendees are asked to vote for their favorite presentations and speakers, as well as the best networking and trade show experiences.

### POWERTEST26 TECHNICAL PRESENTATION AWARDS

#### Best Overall Presentation

Brandon Dupuis, OMICRON  
*It's Called Power Factor: Top Tips and Tricks for Power Factor Testing*

#### Best Sales and Business Management Presentation

Mose Ramieh, CBS Field Services  
*Becoming the Technician: Elevating Reliability, Excellence, and Trust in Electrical Field Services*

#### Best Transformer Presentation

Jon Bucciarelli, SDMyers  
*The Eight Truths of Transformer Reliability: What Every Reliability Program Must Get Right*

#### Best Relay Presentation

Morteza Talebi, PowerX  
*From Theory to Field: A Deep Dive into Transformer Through-Fault Testing Methodology*

#### Best Emerging Technology Presentation

Kenneth Peterson, Power Engineering Services - A Quanta Services Company  
*Powering the Future: Building a Skilled Testing and Commissioning Workforce for a Modernized Grid*

#### Best Electrical Safety Presentation

Steve Park, Electrical Reliability Services  
*The Importance of Stop-Work Authority*

#### Best Equipment & Reliability Presentation

Michael Labeit, RESA Power  
*Bolted Connections: A Primer*

#### Best Electrical Equipment Maintenance Presentation

Matt Robinson, Sigma C Power Services  
*Cradle to Grave: Leveraging NFPA 70, 70B, and 70E as a Total Solution Provider*

## POWERTEST26 TRADE SHOW EXPOSITION AWARDS

**Best in Show:** OMICRON

**Crowd Favorite:** PowerX

**Most Innovative:** intellirent

**Rising Star:** Moonshot

## POWERTEST26 HOSPITALITY SUITE WINNERS

**Most Welcoming:** IPS — Integrated Power Services

**Best Late-Night:** Vector Power

**Best Interactive Experience:** EPS

**Best Signature Drink:** Saber Power

**Best Theme Execution:** Megger

**Most Innovative Design:** RESA Power

**Best Brand Representation:** Group CBS

**Most Popular Hangout Spot:**

Power Engineering Services - A Quanta Services Company

**Most Unique Menu:** Shermco

**PowerMixer Bar:** Protec



## NETA SERVICE PARTNER AWARDS

NETA also recognized the service partners who support the Association and its mission throughout the year.



**Furrie Steelman**

Expo Group  
*PowerTest Trade Show Architect*



**Neil Sepulveda**

Long Beach City College  
*Electrical Testing Technician Curriculum Champion*



**Ken Morton**

NAMO – NETA Accredited Military Organizations  
*NAMO Technician Training Champion*



*Ron Widup Addressing Bravo Company Soldiers*

## STRENGTHENING MILITARY PARTNERSHIPS THROUGH THE **NAMO PROGRAM**



*NETA President Dan Hook at Alpha Company*

The NETA–NAMO Program continues to serve as a vital bridge between the electrical power testing industry and military organizations, reinforcing shared priorities of safety, reliability, and technical excellence. Recent outreach activities highlighted NETA’s ongoing commitment to supporting military electrical professionals through certification awareness, training resources, and direct engagement with service members in the field.

### **SITE VISITS: ALPHA, BRAVO, AND CHARLIE COMPANIES**

Key milestones in this effort have been site visits to the 249th Engineer Battalion’s Alpha, Bravo, and Charlie Companies, where NETA representatives met directly with soldiers to present information on NETA certification

programs and the value of standardized testing practices. Discussions focused on how NETA certifications support mission readiness, reinforce best practices for electrical system maintenance and testing, and translate seamlessly into civilian career pathways. The sessions also provide an opportunity for open dialogue, allowing service members to ask questions and explore how certification can complement their existing military training and experience.

### **NAMO AT POWERTEST26**

Building on this engagement, the NAMO Breakfast at PowerTest26 brought together members of the NAMO Advisory Committee and military attendees from MUSE and the 249th Engineer Battalion. The breakfast served as a collaborative forum to share updates on the NAMO program, discuss workforce development needs, and strengthen relationships between NETA, testing firms, and military units. These conversations underscored the growing importance of aligning military training with industry-recognized standards to ensure continuity of skills and knowledge across both sectors.



*(Left to right): Craig Salmon, Jakenya Hill, Ken Bassett, Ken Anderson, and Amy Williams at the 249th Engineer Battalion, Charlie Company*



*NAMO Advisory Committee and Military Attendees at PowerTest26*



*Amy Williams, Alfonso Marquez, and Ron Widup Celebrate Justin Galindo's (second from left) Level 3 Technician Certification*

## NETA LEVEL II ASSISTANT TECHNICIAN

Several of the military attendees at the breakfast currently hold NETA Level II Assistant Technician certification, demonstrating the strong technical capabilities already present within these units. Their participation reflects increasing adoption of NETA credentials among military electrical professionals who recognize the value of certification as a professional benchmark and a career development tool. NETA remains committed to supporting these individuals as they pursue advanced certifications, expanded training opportunities, and continued professional growth.

## NAMO Advisory Committee

The NAMO Advisory Committee continues to play a critical role in guiding these efforts by providing insight into military workforce

needs, helping shape outreach strategies, and identifying opportunities for deeper collaboration. Through site visits, educational sessions, and industry engagement events such as the PowerTest NAMO Breakfast, NETA is working to ensure that military electrical professionals have access to the same high standards, resources, and professional recognition as their civilian counterparts.

As the NAMO program evolves, NETA remains focused on expanding awareness of certification pathways, supporting ongoing training initiatives, and fostering strong relationships with military organizations. These efforts not only enhance technical excellence and safety within military operations, but also help prepare service members for long-term success throughout their careers—in uniform and beyond. [NW](#)

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## JAMES R. WHITE SAFETY AWARD

# SCOTT BLIZARD: A LIFELONG COMMITMENT TO SAFETY LEADERSHIP

Every year, NETA presents the James R. White Electrical Safety Award to an individual who has followed in the footsteps of Jim White, promoting electrical safety in their own organizations and across the industry. “Jim White dedicated his career to electrical safety, and the 2026 award goes to another safety warrior who has worked tirelessly for safety education and standards development,” Board Member Ron Widup told the audience at the Member and Alliance Luncheon during the recent 2026 PowerTest conference in Nashville, Tennessee.

“In the 15 years Scott Blizard has been a NETA Board member, he has held many leadership roles, including past-president, current secretary, and chair of multiple committees,”

added Widup. “He is honored here today for his service as NETA Safety Committee Chair, and to recognize his contributions towards assuring worker safety....and in particular, those NETA field service technicians and engineers in the field.”

“Having known Jim White as an educator and a safety professional, it is an honor to receive such an award in his memory,” Blizard says. “A lot of thought goes into selecting a worthy recipient each year for this award, and I am honored to be this year’s recipient.”

### ADVANCING NETA’S CORE VALUE OF SAFETY

As Chair of the NETA Safety Committee, Blizard has been instrumental in advancing the Association’s core value of safety by modernizing minimum safety guidelines, integrating safety reviews into the accreditation



*Blizard was surprised and honored to hear his name announced.*



*Blizard accepted the Electrical Safety Award from NETA Executive Director Bryant Phillips.*

process, and supporting member companies of all sizes. He brings deep technical expertise and has contributed to industry standards through his work with NETA and NFPA. Widely regarded as a mentor, subject matter expert, and advocate for safety, Blizard's leadership has had a lasting impact on the industry.

NETA Executive Director Bryant Phillips shared, "As a NETA Board of Directors member for 15 years, Scott has held multiple leadership roles. But none of those roles is more important than his current role as NETA's Safety Committee Chair. Scott has significantly advanced the Safety Committee's direct involvement in the NETA member application and review process and established report templates to support the entire electrical testing industry."

Kristen Schmidt, USC Power, reflects, "He's built a great Safety Committee. We all appreciate his expertise and insights into safety. He has always been an advocate for safety and a great NETA supporter."

"One of the highlights of my career was helping to write the first NETA Safety Guideline in the 1990s," recalls Blizard.

"I've worked with Scott Blizard on the NETA Board for many years," says Jim Cialdea of Sigma C Power Services. "During that time, he has been the Chair of the NETA Safety Committee and has done an excellent job putting together safety programs for existing members as well as for new members. That is an important benefit for some of the smaller companies that don't have anyone on staff with Scott's expertise."

“Scott Blizard is a perfect recipient of the Jim White Safety Award,” adds Jim Dollard, who retired from IBEW. “I spent a lot of time with Scott on Code Making Panel 10, and like Jim White, Scott has a laid-back style in committee meetings. But when Scott speaks, he speaks dynamically, and everybody in the room listens. He is one of the few NFPA committee members I have met who has contributed significantly to safety. His contributions will live for a long time.”

## A LEGACY OF EXCELLENCE

“I’ve been very fortunate in my career,” Blizard acknowledges. “Becoming a member of the International Brotherhood of Electrical Workers (IBEW) Local 103 in 1983, going to work for American Electrical Testing Co. Inc. (AET) in 1986, and developing AET’s first safety manual in the 1990s set the stage. But becoming a NETA Level 3 Certified Technician and Level 4 Certified Senior Technician tops the list. Later, I was fortunate to acquire AET

with my brother, Charley Jr, and we developed and grew AET into a solid entity,” he recalls.

Schmidt says, “Scott Blizard brings with him a legacy of electrical testing, following in his father’s footsteps and growing his business to what it is today. His dad, Charlie Blizard Sr, was a NETA Board member for over 20 years. He had a deep dedication to excellence in all aspects of his work, and Scott is cut from the same cloth.”

“My father, Charles K. Blizard Sr, truly believed in giving back to the industry through participation in NETA. He served on the NETA Board, including as President, and represented NETA on Code Making Panel 10 of the National Electrical Code,” Blizard recalls. “I’ve also represented NETA on NFPA NEC CMP10 and served as an alternate to Dave Huffman on NFPA 70B and several other committees over the years. Being part of NETA allows you to actively participate in the electrical power industry. It’s your chance to have a voice and make a difference.”

IN MEMORIAM



*Norma and Charles Blizard at a Social Event with Friends*

## CHARLES K. BLIZARD SR.

August 4, 1939 – September 29, 2021

On September 29, 2021, NETA and the electrical testing industry had to say goodbye to a giant, Charles K. Blizard Sr. — Charlie to his friends — who left a legacy of lives and careers he touched, an industry he helped mold, and the indelible mark he made on this association.

In marking Charlie's retirement in 2006, former NETA Director Mary Jordan said, "If you are NETA certified, if you own a NETA company, if you used a NETA company, if you are the NETA specifications or reference them, if you are involved in the electrical industry in any way, you should be thanking Charles Blizard."

Charlie was a member representative and served on NETA's Board of Directors for more than 20 years, including as President, Second Vice President, First Vice President, Secretary, Membership Chair, and Charter Member of the Standards Review Council. He was instrumental in achieving NETA's

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IN MEMORIAM



*Charles K. Blizard (dark shirt) announced AETCO's sale to son Charles Jr. (far right) and Scott Blizard (far left) at the 2000 company meeting at The Tall Ships Boston Harbor (pictured here with Norma Blizard).*

“Charlie was a distinctive and valuable member of NETA's Board of Directors. He brought a perspective that caused others to think thoroughly about the issue at hand,” says John White, President Emeritus, Sigma Six Solutions. “He was never shy about sharing facts or opinions. He was very direct in his communication, not mincing thoughts. You always knew where Charlie stood on issues. And whether others agreed with him or not, it was the debate on a topic that made NETA stronger.”

Earning a degree in electrical engineering from Drexel University in Philadelphia, Charlie got started in the industry in 1958 as a Test Technician for Philadelphia Electric Company. In 1967, he became Assistant Director of the Multi-Amp Institute (now AVX Training Institute), where he developed testing equipment and training courses and taught numerous classes. In 1971, he joined Elton as Chief Engineer; he eventually managed the New England operation and founded American Electrical Testing Company, Inc. in 1981.



*NETA Board of Directors 1991-1992. Standing Left to Right: Robert J. White (ELEMCO); David Holzer (Dexter Systems Testing); Roger Day (Sherwin Industries); Mark Ongoff (NETA Corp.); Marc A. Rowand (Alec F. Jones Corp.); Alan Peterson (Utility Service Corp.); Robert Hagmann (Pitt Services Inc.); Seated: President 1991-1992 Charles K. Blizard Sr. (American Electrical Testing Co. Inc.)*

CHARLES K. BLIZARD SR.

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*The Blizard family have been NETA leaders for decades.*

## **BUILDING STRONG SAFETY PROGRAMS**

Jason Briggs, CEO of Asplundh Electrical Testing, says he has had the pleasure of working with Scott Blizard for the last 20 years. “Scott has been instrumental in our safety and leadership human performance programs,” Briggs says. “I’ve looked to his guidance over the years as a mentor to help us shape the program and keep it fresh. I consider Scott a legend.”

Kristen Schmidt of USC Power remembers, “As Scott became more involved with NETA, he and I formed a great working relationship as he took on the committee chairmanship for the Safety Committee. He worked hard to get NETA’s minimum safety guidelines updated to current industry standards, and he made this foundational document what it needed to be for the Association and its membership.”

“It’s a guidepost document,” Schmidt explains, “not only with regard to NETA Accredited Company safety standards, but also to ensuring that all NETA technicians make it home to their loved ones at the end of each day. Over the years, Scott has grown into one of NETA’s most valued assets as a Board member and a respected subject-matter expert, serving on multiple committees. I’m proud to call him a colleague and a friend, and he absolutely embodies the spirit of this recognition. I know Jim White would agree.”

Dino Gelfusa, Asplundh Electrical Testing, says, “Scott was definitely hands-on regarding safety. He pushed the fact that our health and safety were far more important than a profit.”

NETA Director of Sales and Marketing Jill Howell agrees. “Scott is one of the Association’s biggest safety advocates, and he has been the Safety Committee Chair for a long time. This committee provides direction for the Association because it regularly reviews the safety programs of NETA Accredited Companies.

“‘Safety Corner’ is a regular *NETA World* column,” Howell adds. “In fact, the safety column is probably one of the most-read columns we have,

and Scott wrote it for many years. He did hand over the baton a couple of years ago, but I know he still reviews every article before it goes to press.”

Paul Chamberlain, a colleague at American Electrical Testing and now at Asplundh Electrical Testing, points to Blizard’s expertise. “Scott was heavily involved in the investigation process for accidents and in mitigating and preventing potential injuries to employees and others. He has extensive experience and knowledge in the electrical testing industry. He has always been at the forefront when it comes to equipment safety, designing for equipment safety, and training for NETA Certified Technicians.

## **A TIRELESS BOARD LEADER**

“Scott has been on the NETA Board of Directors since June 2010,” Howell remembers. “He took over from his dad and threw his whole heart into being an engaged NETA Board member. He works very diligently to represent the safety perspective and supports all the initiatives and programs that the Association delivers to the industry.”

“Scott is a technician, but he’s also very astute,” Howell continues. “He knows every aspect of being a NETA Accredited Company, so he was very helpful in helping me understand how to support our members, how to think about marketing to the power industry, and how to build relationships between the power industry folks and NETA. I’m truly grateful to him.”

## **FINAL THOUGHTS**

“No member of the Association has done more than Scott Blizard to support the advancement of NETA’s abiding core value of safety,” says Bryant Phillips. “Congratulations on this great honor, Scott. It’s well-deserved.”

“It is an exciting time for the industry,” Blizard says. “The projected demand for electrical power and the amount of work that will be created to meet the demand will be sizable. As for me, retirement is next. I will be chasing a little white ball around a green fairway, searching for the elusive endless summer.” [NW](#)

## NETA OUTSTANDING ACHIEVEMENT AWARD

# CHASEN TEDDER: TECHNICAL EXCELLENCE AND CHARACTER

“Each year, NETA selects a dedicated volunteer who has served on multiple NETA committees and is a champion in the industry for the advancement of electrical safety, quality service, and relationship-building,” NETA President Dan Hook told members and guests at the PowerTest26 Member and Alliance Recognition Luncheon in Nashville, Tennessee. “This year, we have selected Chasen Tedder of Hampton Tedder Technical Services, a third-generation leader in the electrical testing and engineering industry.”

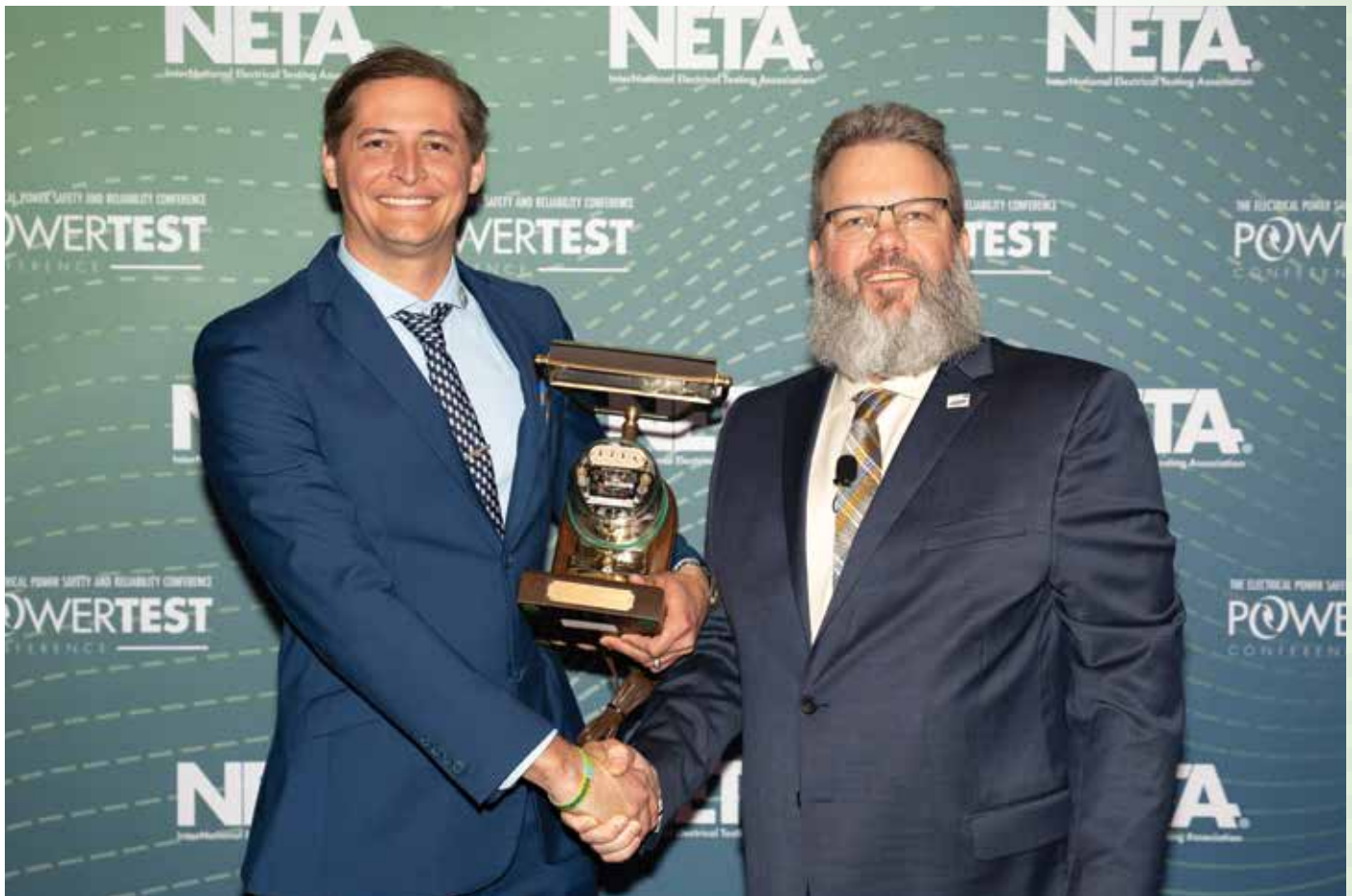
Hook explains, “Known for his exceptional technical expertise, high standards, and commitment to safety, Chasen oversees complex high-voltage, substation, solar, and battery storage projects while mentoring engineers and technicians across the company.”

Chasen, who currently serves as 1<sup>st</sup> Vice President on NETA’s Board of Directors and on multiple NETA committees, says receiving the Outstanding Achievement Award is “truly an honor.” He points out, “NETA is an exceptional organization that plays a vital role in supporting our industry and helping keep the world operating reliably. What makes it even more special is that it is largely powered

by volunteers who are deeply committed to its mission. To be recognized by NETA as the Outstanding Individual of the Year serves as meaningful validation of the hard work and dedication that so many of us contribute toward this shared mission.”

### **INTELLECTUAL ABILITY AND TECHNICAL EXCELLENCE**

Chasen Tedder has been an integral part of his family’s business since 2005. Now, with more than 15 years of experience in high-voltage testing, engineering, and commissioning, Chasen oversees technical operations, engineering, facilities, and sales as Vice President of Hampton Tedder Technical



*Chasen Tedder Accepts NETA's Outstanding Achievement Award from NETA President Dan Hook*

Services. His specialties include cable testing, protective device coordination and testing, and online partial discharge testing.

“Raised in a competitive, engineering-minded NETA family, Chasen grew into a respected industry voice through his work on NETA’s Board of Directors and committees,” adds Hook. Colleagues and family describe him as hardworking, brilliant, and deeply principled—a leader who does things the right way and lifts others with him.

“I’ve been fortunate to experience many meaningful highlights throughout my career,” Chasen acknowledges. “The opportunity to advance quickly while achieving several professional milestones along the way has been especially gratifying.” Still, Chasen also asserts that “the moments that bring me the greatest

pride are not the titles or credentials listed after my name, but the opportunities to make a real impact. Some of the most rewarding experiences have been helping businesses and communities recover from critical outages—situations where facilities might otherwise remain offline for weeks or months, and our Hampton Tedder team is able to restore operations within hours.”

### **COMMITMENT TO QUALITY, SAFETY, AND DOING THINGS RIGHT**

Chasen’s commitment to quality, safety, and doing things the right way has become a benchmark for those around him. Jim Andersen of Hampton Tedder notes that Tedder’s involvement in complex projects has elevated standards across the board. “Chasen’s been more involved in the big battery storage



*Chasen and Matt Tedder Sr.*

and solar projects, and he's done a great job. We've done well, with a very consistent product. It's always important to me to have a good, consistent quality product, and Chasen thinks it's as important as I do."

Insistence on doing things correctly translates directly to trust, says Daniel Rochin of Hampton Tedder. "You can truly trust that when Chasen is involved, the work will be done correctly and safely." From a personal perspective, Tedder's wife, Samantha Tedder, explains, "Chasen wants to be the best. He prides himself on delivering the highest quality. If you hire him, you know you're getting the best."

## LESSONS LEARNED FROM THE NETA COMMUNITY

Chasen's involvement with NETA began early through the family business and grew from there. Chasen notes that his professional involvement with the NETA organization began by simply attending meetings and contributing ideas. "Over time, I became more actively engaged by serving on the Member Application Review Committee and contributing as a subject matter expert for the Exam Committee," he says.

Chasen continues, "I was honored to join the Board of Directors in 2019. A few years later, I was invited to serve on the Standards Review Council. More recently, I joined the Executive Committee as a Board Officer and currently serve as 1<sup>st</sup> Vice President. I also recently founded and chair the Qualified Electrical Maintenance Company (QEMC) Committee.

"The NETA community is truly remarkable," Chasen adds. "It is rare to see hundreds—if not thousands—of competitors regularly come together in a cooperative and professional environment to improve the industry and ultimately help make the world a better place."

Chasen points to the benefits of being part of the NETA Community for himself as well as his company. "On a personal level, regularly participating in NETA meetings has accelerated my growth in multiple areas, including technical knowledge, leadership, management, business development, and overall professional development," he says. "For Hampton Tedder, the shared knowledge and collaboration within the NETA community have helped us navigate evolving industry challenges such as mergers and acquisitions, emerging technologies, vendor qualifications, and many other complex issues."

Chasen notes, "One of the most valuable aspects of the NETA community is the opportunity to engage with peers who are facing similar challenges but approaching them in different ways. Learning from the successes

and setbacks of others in a constructive environment helps everyone grow and strengthens the industry as a whole.”

Personally, Chasen adds, “That knowledge sharing has grown my perspective and developed me into a much better leader than I ever could have been without it. One of the best lessons I’ve learned is that you have two ears and one mouth for a reason. Leadership and problem-solving start with listening and understanding, and rubbing elbows with the best in the industry is a great place to listen and understand.”

## **LEADERSHIP, MENTORING, AND KNOWLEDGE SHARING**

As Chasen’s career developed, natural intelligence evolved into technical mastery. “Chasen’s strength is his technical skill,” explains Andersen. “He remembers anything he’s read, and he knows where to go get it. He is technically that strong.”

Equally significant is Chasen’s active role as a leader and mentor. “Chasen does monthly trainings with many of the guys, and they value this time with him where he shares his passion and gives them a look at the electrical testing side

of the business,” says Frank Aguilar of Hampton Tedder. “Personally, I’m a visual learner, and Chasen will take the time to draw out whatever the issue is so you understand the next steps and what the resolution could be for the customer.”

Rochin believes Chasen’s leadership is grounded in humility and support. “Chasen’s one of those guys who doesn’t just hold a title. His technical knowledge speaks for itself, but what truly sets Chasen apart is how he’s willing to share it,” he says. “He pushes people to do better and also supports them every step of the way. He cares about their growth and learning and doing things the right way.”

Chasen’s reputation preceded him within the broader industry. “I met Chasen at PowerTest in 2019. I was just getting started in the electrical testing world, and I immediately noticed that Chasen and his team had the reputation and resume that made Hampton Tedder different,” Aguilar recalls.

## **FAMILY, LEGACY, AND PERSONAL CHARACTER**

At the core of Chasen’s story is family and legacy. His mother, Christine Tedder, reflects on the generational roots of his profession:



*Maxwell, Dakota, Chasen, Matt Sr., Matthew Jr., and Myles Tedder*

“Chasen’s grandfather learned his trade in the military and went on to create a high-voltage cable splicing company.”

From an early age, Chasen’s intellectual ability and curiosity set him apart. Brother Maxell Tedder remembers, “Chasen was always willing to help others understand complex ideas. He would always help you—you just had to translate it from genius to something the rest of us could understand.”

Chasen’s passion is personal and deeply felt. “Chasen truly enjoys going to work every day. That comes from who he is—he loves tinkering, figuring things out, and problem-solving,” says Samantha Tedder. “He’s passionate about being part of a family business and excited about continuing the legacy of having a Tedder in NETA and being at the forefront of the industry.”

Chasen’s father, Matt Tedder, Sr, recalls, “The whole family grew up racing dirt bikes and fixing high-voltage systems. Chasen was always the most interested in how things worked—especially electrical systems.” He adds, “He’s stepped it up in every way. He’s a superstar, and he truly deserves this award.”

## LOOKING AHEAD

Thinking about what’s next, Chasen says, “First on my list is family. Spending more time with my amazing wife and kids at their young ages is important to me.

“After that, if the membership will have me, hopefully, the NETA Presidency. I look forward to mentoring the next generation of technicians and leaders coming into our industry and helping shape this great community as I go.” [NW](#)



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## ALLIANCE PARTNER RECOGNITION AWARD

# SCOTT REED: TECHNICAL EXPERTISE, LEADERSHIP, AND SERVICE

“NETA is proud to honor Scott Reed of MVA Services with the Alliance Partner Recognition Award for his outstanding contributions to the electrical testing industry,” began Alliance Program Committee Chair Jim Cialdea. “This award recognizes individuals who advance safety and reliability through leadership, service, and the development and application of consensus standards within the electrical power industry. Scott Reed exemplifies these qualities through his dedication to the industry and his lasting impact on electrical testing professionals nationwide.”

Cialdea added, “Scott Reed’s impact on the transformer and electrical power industry is measured not only by technical expertise, but by leadership, mentorship, and service. As the founder of MVA Diagnostics and MVA Services, Reed has built organizations that combine deep engineering knowledge with practical, field-tested experience—earning the respect of colleagues, competitors, customers, and employees alike.”

When Reed was named the recipient of the Alliance Recognition Award at the Member and Alliance Recognition Luncheon at PowerTest26, his initial reaction was surprise.

“The recognition was unexpected but deeply meaningful,” he says, “particularly because it reflected feedback from customers, colleagues, and employees.” Hearing those perspectives prompted reflection on the relationships built over the course of his career.

“This industry is built on collaboration, and I’ve been fortunate to be surrounded by great people,” he shares. “I’m grateful for the recognition, especially coming from an organization like NETA, and I see it as a reflection of the people I’ve had the opportunity to work with throughout my career.”



*Scott Reed Accepts the Alliance Partner Recognition Award from Jim Cialdea*

## **BUILDING AN ORGANIZATION**

From the earliest days of MVA Diagnostics and MVA Services, Scott Reed has been known for pairing deep technical knowledge with a genuine commitment to people, Cialdea says. That combination, colleagues agree, is what has fueled his professional success and his influence across the electrical testing and transformer industries.

Todd Felton of MVA Diagnostics recalls joining Reed in 2014, when the company was little more than an idea and an empty office. Under Reed's leadership, the organization grew into a full-scale diagnostic laboratory serving the transformer oil fluid industry, expanding into larger facilities, deploying multiple service trucks, and achieving consistent year-over-year growth.

“Scott’s ability to move seamlessly between field work and business strategy has been central to that success,” says Felton. “It is a skill Scott developed intentionally—staying close to the work while building organizations designed to support longterm industry needs.”

## **COMMITMENT TO THE INDUSTRY**

Reed recalls, “I first got involved with NETA in 2005 because I saw it as a way to connect with qualified electrical testing companies and to become more engaged with the industry as a whole—and NETA provided a platform to do that. Over the past twenty years, my involvement has grown to include reviewing and helping shape standards, writing articles, and working to support the organization in a meaningful way. It’s been less about participation and more

about helping move things forward where I can. In addition, I serve as the IEEE Transformers Committee liaison to NETA, which allows me to help bridge insights between the transformer and testing communities.”



*MVA at Work at a Transformer Project*

Those contributions have not gone unnoticed. Within industry standards organizations such as IEEE, ASTM, and NETA, Reed is widely respected for his technical expertise in transformer maintenance, diagnostics, and life assessment. Currently serving as Vice Chair of the IEEE Transformers Committee and moving toward a leadership role, he brings what colleagues describe as a rare boots-on-the-ground perspective. Tom Prevost of IEEE, who has worked with Reed for more than two decades, credits that field experience as a defining strength. “Scott’s knowledge,” he notes, “is rooted not just in theory, but in years of firsthand work and countless volunteer hours dedicated to improving industry practices.”

## PERSONAL IMPACT

Reed’s impact is also personal. Tiffany Wiley of Fortune Electric describes him as a trusted mentor from the very beginning of her career. She credits his ability to take complex principles and translate them into real-world understanding—along with his openness to professional and personal conversations—as

reasons so many engineers turn to him for guidance. That approachability is echoed by Stephanie Mabry of AVO Diagnostics, who has collaborated with Reed for more than a decade through the IEEE Transformers Committee. Having known him as a customer, colleague, and competitor, she emphasizes his integrity and commitment to passing knowledge down to the next generation.

“Personally, NETA has been invaluable,” Reed says. “I’ve built lifelong professional relationships that have turned into real friendships over the years. PowerTest is an event I look forward to every year because it’s a chance to reconnect with so many people I’ve come to know well. I’ve also had the opportunity to contribute as a speaker and currently participate on the Transformers Panel, which has been very rewarding.

## PARTNERSHIPS BUILT ON TRUST AND VALUE

Reed’s collaborative mindset extends to how he approaches business partnerships. As a Corporate Alliance Partner, MVA has focused on building trust by providing recommendations grounded in sound technical data.

“From a business standpoint, NETA has been a strong platform for MVA,” he continues. “Being a corporate sponsor helped position us as a trusted partner for oil testing and oil processing services. We view NETA as a key partner in helping us deliver our services to the industry, and that collaboration has been mutually beneficial.”

Inside his own organizations, Reed’s leadership style reflects his understanding of field service realities. Nate Gover of MVA Services notes that Reed has done the work himself and understands the demands placed on technicians who spend long stretches on the road. That empathy, combined with fairness and transparency, has helped foster loyalty and trust. Dan Haren, Vice President of Services at MVA Services, adds that Reed has been instrumental in shaping a company culture

centered on teamwork, education, and respect. “Our customers regularly invite Reed to their facilities to teach classes on oil diagnostics and transformer commissioning, which reinforces his role as a technical expert and an educator,” Haren notes.

From the customer perspective, Reed’s value lies in expertise as well as results. Deanna Woods of Pennsylvania Transformer points to significant cost savings achieved by using MVA Diagnostics’ dissolved gas analysis services. “Beyond the technical benefits, our shared involvement in the IEEE Transformers Committee has strengthened a professional relationship that has grown into friendship,” she recalls.

## LOOKING AHEAD

Looking ahead, Reed remains focused on expanding MVA’s capabilities in oil testing and field services to better support an industry facing aging assets, extended manufacturing backlogs, and ongoing supplychain constraints. “Preparation means investing in laboratory capacity, improving data delivery, and staying closely connected to customers’ realtime challenges,” he says.

“When you take that approach, relationships naturally evolve into long-term partnerships,” Reed explains. “Those partnerships create a strategic advantage because they’re built on credibility and reliability, not transactions. It also opens the door for collaboration across companies, where we can align our services with the needs of NETA members and help them better serve their clients.

Over time, that trust-based model has allowed us to become a go-to partner for our services, strengthening our position and the value we bring to the industry.”

“We plan to continue expanding our relationships within the NETA community by consistently demonstrating the value MVA brings to member companies. That starts with



*Reed (second from right) Participates on the Transformers Panel at NETA’s PowerTest26*

delivering high-quality, reliable services and supporting our partners in a way that helps them succeed,” Reed shares.

“Beyond that, we’re focused on growing our capabilities in oil testing and field services so we can provide more comprehensive solutions to the industry. As the demand for maintaining aging transformer fleets continues to increase, we see an opportunity to play a larger role in helping NETA members extend asset life and improve reliability.”

## CONCLUSION

While the current environment presents obstacles, Reed sees opportunity for organizations willing to focus on longterm partnerships and continued investment. For young professionals entering the industry, Reed’s advice is simple but deliberate: Get involved, seek mentors, and commit to contributing—not just participating. “This is a career you might spend 40 years in,” he says. “It’s not just a job. Giving back through standards work, mentoring, and knowledge sharing doesn’t just advance an individual career; it strengthens the industry as a whole.” **NW**

## LIFETIME ACHIEVEMENT AWARD

# LYNN HAMRICK: A LIFETIME OF INTEGRITY, IMPACT, AND INFLUENCE

“NETA’s Lifetime Achievement Award honors individuals whose careers reflect exceptional commitment to the organization, its mission, and the advancement of the electrical power industry. Lynn Hamrick exemplifies these ideals perfectly,” said NETA Board Member Ron Widup. “For a lifetime of service marked by technical excellence, integrity, leadership, and an unwavering dedication to safety and quality, NETA proudly recognizes Lynn Hamrick with its Lifetime Achievement Award.”

Hamrick, the retired owner of ESCO Energy Services, now part of Shermco Industries, was honored during the PowerTest26 Member and Alliance Recognition Luncheon in Nashville, Tennessee.

By all accounts, an engineer first in every sense, Hamrick is widely respected for his ability to explain complex technical concepts with clarity and purpose. His practical, questioning approach and insistence on doing things the right way earned him a reputation as a candid, no-nonsense professional whose judgment was consistently trusted across the industry.

### ENGINEERING RIGOR AND DISCIPLINE

That sense of service has been present since the very beginning of Hamrick’s professional journey. Early in his career, he was immersed in nuclear plant design and startup work, where he remembers being introduced to

rigorous design, documentation, and testing requirements. As his career progressed into nonnuclear engineering and eventually the electrical testing field, that foundation shaped everything that followed.

Safety and quality were central to everything Hamrick did. He set high expectations for protecting technicians and ensuring systems were installed, tested, and maintained correctly. He believed excellence in standards and procedures was essential not only to performance, but also to the well-being of people and facilities alike.

### SUPPORTING TECHNICIANS AND THE INDUSTRY

Hamrick’s involvement with NETA began from a desire to support others. “My technicians first pointed me toward NETA as a way to support their technical development,” he explains. As his participation deepened, two



*(Left to right): Ron Widup, Linda Hamrick, with Lynn Hamrick Accepting the NETA Lifetime Achievement Award*

individuals played pivotal roles in encouraging his engagement: Stuart Jackson, who urged Hamrick's company to become actively involved, and Ron Widup, who continued that encouragement and support over the years. "In 2010, Esco became a part of Shermco, and we worked hand-in-hand, side-by-side for many years," Widup confirms.

Among the many roles Hamrick held within NETA, serving on the Board stood out to him as the most rewarding. "I served as a member of the Safety Committee and chaired it for a short time," he remembers. "I also served on the Membership Committee and participated in reviews and recommendations for new-member applications. That role allowed me to build lifelong friendships and establish business relationships that supported future growth and development." Hamrick shares that committee

leadership was also meaningful, though not without its challenges. "Not every committee member shares the same focus, and getting everyone aligned and moving in the same direction required effort," he recalls.

### **ADVANCING THE INDUSTRY BY SHARING KNOWLEDGE**

Asked to reflect on his greatest contribution to NETA, Hamrick points to his work as a technical writer. "My background in technical writing from the nuclear industry allowed me to contribute extensively to *NETA World*," he says, "and the research required for those articles expanded my own knowledge while helping me stay current with evolving technology." Hamrick continues to believe that "contributing content to *NETA World* should be a responsibility of every NETA company."



*Hamrick (seated center top) at a Committee Meeting*

Jason Greer of PowerX echoed the significance of Hamrick’s contribution. “This recognition for Lynn is truly well-deserved. Throughout his career, he has demonstrated exceptional service to NETA and to the industry through his technical writings, and he loves to write—he’ll tell you that!”

Greer notes that Hamrick’s rare ability to explain complex concepts clearly, regardless of audience or technical level, is “a truly world-class skill.” He adds, “I have personally benefited from his knowledge and guidance over the years while navigating challenging situations. His impact on the industry and those who’ve had the privilege of working with him is significant and lasting.”

## **A REPUTATION BUILT ON INTEGRITY**

Hamrick says being a man of integrity when dealing with others has always been his guiding principle. “That means doing what you say you’re going to do, and doing it in a way that uplifts those around you,” he explains.

Widup has seen that principle in action for decades. “In your career, you meet people who make an impression on you, and one of those people is Lynn Hamrick,” he says. Widup recalls

serving alongside Hamrick on the NETA Board and a defining moment during the Father’s Day flood in Cedar Rapids. “Lynn called and said Cedar Rapids was experiencing a 500-year flood, the town was underwater, and they needed some help,” Widup remembers. That call led to a critical recovery project at the Cargill Corn Milling Plant, a deeper professional bond, and ultimately the acquisition of Esco Energy Services by Shermco Industries.

“Lynn is a fantastically smart engineer. He’s a practical guy, he’s a no-BS guy, and he’s somebody you can always trust,” Widup says.

## **MENTOR, TEACHER, AND TRUSTED ADVISOR**

Equally important was Hamrick’s role as a mentor, teacher, and advocate. Through coaching, authorship, and leadership in advancing NETA standards, he helped develop people, strengthen organizations, and elevate professionalism throughout the industry.

Scott Hardy of Shermco reflects on nearly two decades of working with Hamrick. “He helped me grow as an engineer and as a test technician,” Hardy remembers, “and his unwavering focus on safety and quality left a lasting mark. He expected a lot of his people,

especially related to safety and quality, and he pushed people to do their best.”

Owen Wyatt shares a similar experience. “Lynn coached me through all my NETA certifications and helped me get my Professional Engineer license. He was instrumental in putting me in positions where I could grow and expand my capabilities.” He also highlights Hamrick’s reputation across the industry. “There’s not a single person who doesn’t get along with Lynn and trust his opinion when it comes to virtually any topic.”

Mark Pustejovsky of Megger describes Hamrick as “an engineer first,” someone who instills curiosity and discipline in everyone around him. “He helped you understand why you were doing what you were doing. It was much more than just going out there and testing.”

## INDUSTRY IMPACT BEYOND NETA

Beyond NETA and Shermco, Hamrick’s influence extended deeply into the industrial

world. Dan Chamberlain, retired from Cargill, recalled Hamrick’s calm and thorough approach during complex electrical failures and standards development. “He would research the IEEE and NETA standards to find the potential alarm and action points,” Cargill says. “He also helped us develop our maintenance and risk matrices that changed how maintenance risks were communicated to management.”

Brian Jennings of Cargill added, “He helped us create our maintenance program for Cargill worldwide—not just North America, but all the IEC equipment as well.” Lynn’s ability to discern what was truly needed, rather than simply what was requested, resulted in a program still in use today.

## A LEGACY DEFINED BY CHARACTER

Beyond his accomplishments, Hamrick is remembered for his character—widely respected, universally trusted, and known as both an outstanding engineer and an outstanding person.



*The Hamrick Family*

When Hamrick learned he was being honored with a Lifetime Achievement Award, his reaction reflected the humility and integrity that defined his career. “I’ve been retired for a couple of years, so I was truly surprised. I felt honored, appreciative, and humbled that the organization would recognize me for my contributions.”

Brad Webb of Shermco perhaps sums it up best: “Those of us who know Lynn remember him as an accomplished professional engineer, a teacher, an author, a business leader, a market research analyst, and a great southern gentleman.” Hamrick authored countless articles and a book, and became widely recognized as a subject matter expert on NETA standards.

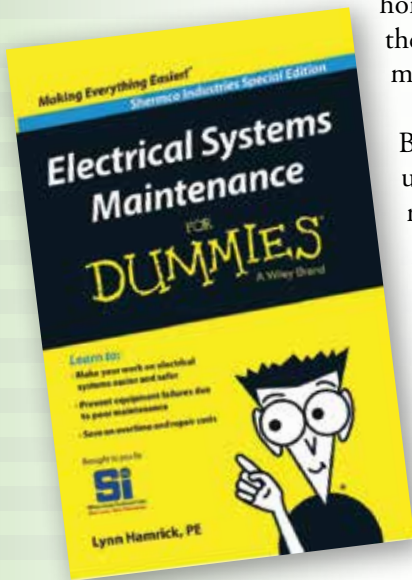
From studying nuclear engineering at the University of Tennessee to

purchasing Esco Energy Services, Hamrick’s career was built on effort and principle. “It was very important to Lynn and to the previous owner to become NETA-accredited,” his wife, Linda, explains. “Lynn worked hard to get NETA-accredited, and he was so proud to be able to tell his customers, ‘We’re a NETA company.’ He knew that everything would be safe and reliable if it were properly installed.”

“Personally, Lynn is very no-nonsense, but in a nice way,” she shares. “Being recognized for a Lifetime Achievement Award is really special, and I am so proud of him.”

## CONCLUSION

Lynn Hamrick’s legacy is not defined by a single role, title, or accomplishment, but by decades of integrity, mentorship, and service, Widup says. “The industry—and the people within it—are undeniably better because of him.” **NW**



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## ENER-PHASE SOLUTIONS ACHIEVES NETA ACCREDITED COMPANY STATUS



A full-service electrical testing and engineering firm, Ener-Phase Solutions LTD's strengths include technical expertise and experience in medium-voltage distribution maintenance and acceptance testing, protection and control, and power system engineering. Their goal is to be recognized as an industry leader in creating customized, innovative solutions to real-world problems.


“Our recent accreditation as a NETA Accredited Company is more than a credential—it reflects who we are, how we

work, and where we are going,” says President Arland Eliason. “Achieving accreditation signals to our clients and partners that Ener-Phase is committed to safety, consistency, and best-in-class technical performance. However, just as importantly, it signals a commitment to our staff and their long-term careers.”

From the beginning, Ener-Phase has been built around the idea that investing in its employees is the most reliable way to deliver exceptional results. “NETA accreditation reinforces that philosophy by creating a clear framework

for training, certification, and continuous improvement,” explains Eliason. “It provides our technicians and engineers with a recognized professional pathway that enables growth, accountability, and a sense of pride. It validates their expertise, strengthens their professional credibility, and provides opportunities for advancement within a nationally recognized and respected standard.”

“For Ener-Phase, NETA accreditation strengthens our culture,” says Chief Operating Officer Dave Emerson. “It raises expectations and unifies our teams around a shared benchmark of excellence. It ensures that safety and quality are daily practices embedded in everything we do. We are proud of this achievement, grateful to our team for the dedication that made it possible, and excited for the opportunities it can create,” Emerson points out.

“NETA extends a warm welcome to Ener-Phase Solutions Ltd,” says Dan Hook, President of CBS Field Services and current NETA President. “We applaud the important role our NETA Accredited Companies play in advancing the electrical power systems industry and its safety. Achieving NETA accreditation is indicative of Ener-Phase’s accomplishments as an organization.” 



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## INDEPENDENT TESTING AGENCY RECOGNIZED AS NETA ACCREDITED COMPANY



Independent Testing Agency (ITA) is a WOSB-certified, woman-owned small business proudly serving the utility, industrial, commercial, and institutional sectors for over 30 years. Since 1993, it has built a reputation for delivering reliable, high-quality electrical testing and maintenance services tailored to meet the demands of a dynamic and critical industry.

From its headquarters in Hanover, Maryland, ITA serves major industrial, commercial, and institutional clients throughout Maryland, Virginia, Pennsylvania, Washington, DC, and Delaware. The company provides a full line of electrical testing services across the healthcare, government, data center, industrial, and solar energy sectors. All testing, maintenance procedures, and evaluations conform to NETA, IEEE, ANSI, and NFPA recommended practices.

Its team of NETA-certified technicians and engineers specializes in the testing, analysis, and

maintenance of electrical power systems and equipment. Every project is executed in strict accordance with NETA standards and NFPA 70B guidelines, ensuring compliance, accuracy, and the highest level of safety.


Safety is ITA's top priority in everything it does. All team members are trained in safety protocols and provided with personal protective equipment to keep them safe while on the job, and its technicians have met NETA's rigorous certification criteria. The entire staff—technicians, engineers, administrators, and management—is involved in and responsible for the safety of coworkers, customers, contractors, and the communities it serves.

ITA recognizes its obligation to provide a safe workplace, and each employee shares responsibility for maintaining that environment by using safe work practices, regardless of location or task. No project is worth sacrificing employee

safety or damaging customer equipment. Safe work practices are essential to the well-being of ITA's employees and the company.

As a NETA Accredited Company, ITA demonstrates a proven commitment to the highest standards of performance, safety, and technical expertise in the electrical testing industry. "This accreditation signifies that ITA's processes, personnel, and results are independently evaluated and meet stringent national quality and reliability benchmarks," explains President Maria Lane. "For our clients, it provides confidence that every project is backed by certified professionals, standardized procedures, and a dedication to delivering accurate, dependable results that support the long-term integrity of their electrical systems."

"NETA is proud to welcome Independent Testing Agency as a NETA Accredited

Company," says Dan Hook, President of CBS Field Services and current NETA President. "NETA Accredited Companies (NACs) help advance the electrical power systems industry and ensure the safety and reliability of the electrical power system. Achieving NETA accreditation requires dedication and persistence, and we congratulate ITA and its professionals on achieving this milestone event." 



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## SKAGIT ELECTRIC ADDED TO ROSTER OF NETA ACCREDITED COMPANIES



*General Manager Matt Prombo and Technician Jacob Vieira*

Skagit Electric is a licensed small-business, full-service electrical engineering and electrical contractor providing electrical testing, maintenance, thermographic surveying, power studies, repairs, troubleshooting, commissioning, and replacement services to clients ranging from government entities to commercial facilities. They serve Skagit County and nearby areas from their headquarters in Sedro-Woolley, Washington to International locations abroad.

Skagit Electric is available to work at any site, and typically performs work at difficult project sites or challenges other contractors won't accept. Their team has a can-do attitude that allows them to think outside the box to find a resolution for any size problem or project—regardless of size. If security is a concern, Skagit Electric's personnel have up to TS-level security clearances.


Core services include testing, maintenance, commissioning, troubleshooting, thermography, short-circuit studies, protective device coordination studies, arc flash studies, and electrical designs, as well as repairs, replacement, and installation services on electrical critical power systems at new or existing facilities. Skagit's technicians typically work on transformers, generators, transfer switches, MV & LV switchgear, protective relays, MV & LV cables, switchboards, switches, uninterrupted power supplies, voltage regulators and grounding systems.

Skagit's core values include availability, creativity, commitment, and reliability—all leading to customer satisfaction. Work is

done with a focus on right vs. wrong, and clear communication ensures we understand what the customer expects and gets what they paid for.

“Customers have confidence in Skagit Electric because our key personnel all have more than 20 years of experience,” says General Manager Matthew Prombo. “And that confidence is bolstered by Skagit’s values: We listen to what our clients say. All work is done correctly the first time, and there are no shortcuts. Our jobs are not complete until our client is 100% satisfied.”

Prombo explains, “Becoming a NETA Accredited Company is a major milestone for us. It reflects the level of discipline, expertise, and integrity we bring to every project. It’s not just a certification, it’s a commitment to doing work that others can trust.”

“NETA extends a warm welcome to Skagit Electric,” says Dan Hook, President of CBS Field Services and current NETA President. “We applaud the important role our NETA Accredited Companies have in advancing the electrical power systems industry and its safety. Achieving NETA accreditation is something Skagit can be proud of, and this recognition is indicative of their accomplishments as an organization.” 



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## SWITCHGEAR MAINTENANCE SERVICES CERTIFIED AS NETA ACCREDITED COMPANY



When safety and reliability come first, Switchgear Maintenance Services (SMS) can be your NFPA 70E and NFPA 70B compliance team. SMS is a leading electrical testing company specializing in the testing of new and in-service electrical equipment. They take pride in being a cost-effective company while providing excellent services—all using the most up-to-date standards and techniques.


COO David Antkowiak says, “Our goal at Switchgear Maintenance Services is to partner with our clients to make their projects a success. Whether you are a college campus, electrical contractor, industrial facility, or engineering

firm, we are here to meet your needs. The electrical industry is vast, and contractors can find themselves in unfamiliar areas where they need assistance. SMS stands ready to team up with clients on projects where someone familiar with the ins and outs of the procedures and techniques for the installation of medium-voltage equipment and cable is needed. SMS offers consultation and its team of trained personnel, providing clients with the comfort of knowing the installation is correct and safe.”

Switchgear Maintenance Services offers a variety of services, including acceptance testing of electrical equipment to NETA, IEEE, and

ANSI standards; NFPA 70B maintenance; power breaker services and power studies; testing and commissioning of protective relays; infrared imaging and ultrasonic detection; medium-voltage cable work, and more.

"I began as a NETA technician without much knowledge of the overall organization," says Antkowiak. "Our company participated in several NETA events, where we met others who shared our curiosity and dedication to learning all we can about testing and the electrical industry," he explains. "The organization felt like an open and inviting place to ask questions and speak with top industry experts who will give you answers. I believe most people find this career truly rewarding, and NETA is paving the way with commitment to education and safety. SMS is proud to have become a NETA Accredited Company. We hope to help in any way we can to help this industry flourish."

"NETA recognizes the hard work it takes for new NETA Accredited Companies like Switchgear Maintenance Services to achieve this important milestone," says Dan Hook, President of CBS Field Services and current NETA President. "NETA Accredited Companies play a critical role in securing electrical power system safety and reliability for all, and NETA is a stronger organization because of SMS's dedication to our industry." 



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## AMTECK JOINS NETA'S QEMC PROGRAM LEADERS



NETA has recognized Amteck as a Qualified Electrical Equipment Maintenance Company (QEMC) reinforcing the company's commitment to safety, precision, and technical excellence in electrical maintenance.

Founded nearly 50 years ago by Ron Turner, Amteck has grown from a two-person, local operation into a nationally recognized top 50 commercial, electrical contractor, performing work in nearly 40 states for dozens of the most recognized brands in America. Now led by CEO Daren Turner, the company continues to build on its founding principles of safety, service, and quality.

Amteck delivers a full range of services, including design/build electrical construction, service and maintenance, low-voltage technologies, and life safety systems. Preventive maintenance plays a critical role

in its service offering, supporting clients in maintaining safe, reliable, and compliant electrical power systems.


To achieve NETA's QEMC designation, Amteck successfully completed a rigorous organizational review process, verifying its electrical maintenance capabilities, safety programs, equipment calibration practices, and quality procedures. In addition, seven Amteck employees passed the Qualified Electrical Equipment Maintenance Worker (QEMW) exam, demonstrating validated knowledge in performing essential maintenance activities aligned with industry standards.

"We are really excited to earn the Qualified Electrical Equipment Maintenance Company certification," remarked Lorne Smith, Executive Vice President at Amteck, "It's a big deal to qualify because it demonstrates

our commitment to assisting our clients with NFPA 70B requirements.”

The QEMC-QEMW Program was developed in response to the ANSI-approved NFPA 70B Standard for Electrical Equipment Maintenance, which establishes enforceable requirements for maintaining electrical systems. As demand for qualified providers grows, NETA-recognized companies like Amteck are helping facility owners and operators implement maintenance programs that reduce risk, improve reliability, and meet evolving compliance standards.

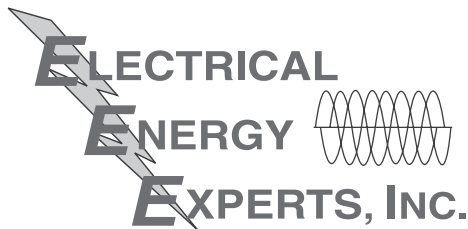
“Amteck is always looking for new ways to grow and better position ourselves in the market,” added Amteck President Corey Bard. “This certification reflects not only where we are, but where we are going, as we continue to invest in building better people and projects.”

“NETA is proud to recognize Amteck as a NETA Qualified Electrical Equipment Maintenance Company,” says Chasen Tedder, QEMC and QEMW Committee Chair. “QEMC-recognized service providers are ensuring their Qualified Electrical Equipment Maintenance Workers (QEMWs) align with the new NFPA 70B requirements and lead the way in meeting the growing demand for electrical power system maintenance services.” 



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## EDWARD G. SAWYER CO. ACHIEVES QEMC CERTIFICATION



Since 1864, Edward G. Sawyer Co., Inc. has been at the forefront of electrical engineering, contracting, and construction across the Greater Boston Area. As the oldest continuously operated electrical company in the United States, a proud NECA signatory contractor, and a signatory contractor to IBEW Local 103, the company brings unparalleled knowledge and insight to every stage of a project's lifecycle. Its highly trained electricians are equipped to safely and efficiently execute even the most complex electrical installations—delivering superior craftsmanship every step of the way. Headquartered in Weymouth, Massachusetts, E.G. Sawyer serves eastern Massachusetts, southern New Hampshire, southern Maine, and Northern Rhode Island.

Leveraging strong team collaboration, cutting-edge technologies, and the specialized

expertise of our diverse divisions means unmatched electrical, structured cabling, converged networks, and preventative maintenance services. The company partners with many of the region's leading general contractors and engineering firms, and its portfolio spans high-profile projects across the healthcare, commercial, higher education, and transportation sectors. In addition to electrical construction, emergency response, and preconstruction services, its electrical maintenance and telecommunications divisions offer comprehensive, full-service solutions.

Since purchasing the rights to TEGG Service in 1997, E.G. Sawyer has been committed to providing the best preventative maintenance and analysis in Eastern Massachusetts, offering a variety of preventative maintenance services, including inspections, infrared thermography,

de-energized services, voltage and current diagnostics, power quality analysis, ultrasonic services and more.

Edward G. Sawyer Co., Inc. was awarded the 2024 TEGG Contractor of the year at the 2025 TEGG Service Continuing Education Conference, recognizing the company's outstanding performance, particularly its success in expanding its sales and service division to drive long-term growth.

"We feel that becoming a NETA QEMC contractor is vitally important to our customers as well as our company, says Scott Jackson, Vice President TEGG Service. "It tells our customer base that we are true professionals and adhere to superior testing practices and have the credentials to prove it; it's also a source of pride for our technicians."

"NETA is proud to recognize Edward G. Sawyer Co., Inc. as a NETA Qualified Electrical Equipment Maintenance Company (QEMC)," says Chasen Tedder, NETA QEMC and QEMW Committee Chair. "NETA QEMC-recognized service providers are ensuring their Qualified Electrical Equipment Maintenance Workers (QEMWs) align with new NFPA 70B requirements, leading the way in meeting the growing demand for electrical power system maintenance services." [NW](#)



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## FERGUSON ELECTRIC NAMED QUALIFIED ELECTRICAL EQUIPMENT MAINTENANCE COMPANY



Ferguson Electric is a full-service electrical contractor with more than nine decades of experience serving commercial and industrial customers throughout New York State. Founded by Whitworth Ferguson Senior, the company opened for business on August 1st, 1935, with leadership rooted in engineering and construction.

Ferguson is still headquartered in downtown Buffalo but has 18 sites throughout New York state. Six company divisions serve the area in construction, engineering, line, renewables, service, and systems. The company has been the leading electrical contractor in Western New York for over 90 years, and has operated under an employee stock ownership plan (ESOP) since 2001.

Ferguson serves a wide spectrum of customers from end-user commercial facilities up to utility and cogeneration plants. Their mission is to provide customers with the highest quality electrical construction and maintenance services. They aspire to maintain a level of integrity, responsiveness, trust, and knowledge that will perpetuate repeat business.

“Rooted in trust and responsiveness, Ferguson Electric delivers the highest quality solutions,” says Service Division Manager Daniel Schultz. “Our connection to quality is directly proportional to our commitment to exceed expectations, and we have the skill, experience, and dedication to address any electrical design, repair, and construction needs. In fact, our professional team has handled a majority of

the construction and service contracts for the commercial and industrial facilities in the Western New York area since our inception.”

Ferguson finds it extremely important to contribute and stay active within the community. The Ferguson Electric Foundation contributes to many local charities and stays involved with various groups that add value to their communities.

“Ferguson Electric is proud to be recognized by NETA as a Qualified Electrical Equipment Maintenance Company,” says Schultz. “As a QEMC, Ferguson Electric is trusted as an experienced contractor with a proven track record of providing the finest service. Aging equipment and power grid resource adequacy are two of the biggest challenges the industry faces. Ferguson Electric can help mitigate these issues by providing excellent service in replacing and repairing equipment and assisting in improving customer electrical efficiency.”

As part of the Federated Electrical Contractors (FEC) network, Ferguson can handle select projects outside of their home state.

“NETA is honored to recognize Ferguson Electric as a NETA Qualified Electrical Equipment Maintenance Company (QEMC),” says Chasen Tedder, NETA QEMC and QEMW Committee Chair. “NETA QEMC service providers ensure their Qualified Electrical Equipment Maintenance Workers (QEMWs) align with new NFPA 70B requirements and lead the way in meeting the growing demand for electrical power system maintenance services.” [NW](#)

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ALLIANCE PROGRAM

## HIPOT ENGINEERING JOINS NETA'S QEMC PROGRAM LEADERS



The fastest-growing electrical testing and maintenance engineering company in Puerto Rico, HiPot Engineering LLC was founded in 2022 by Miguel A. Morales, PE. After years of experience in engineering and leadership roles within the pharmaceutical and industrial sectors—managing complex electrical facilities—Morales took a step of faith, believing in the future, in local talent, and in the importance of disciplined electrical testing and maintenance.

The company was built on a simple but powerful principle: Do the work the right way to protect people, assets, and critical operations. From its inception, HiPot Engineering focused on services for highly regulated and mission-critical environments.

HiPot Engineering continues to move forward with purpose, guided by faith, integrity, and a long-term commitment to supporting the industries and infrastructure that power Puerto

Rico's future. The company's mission is to deliver independent, standards-based electrical engineering, testing, and maintenance services that protect people, strengthen critical power systems, and earn trust through safety, integrity, and precision.

“Our standard is built on independence, technical rigor, and uncompromising safety—executed through qualified personnel, calibrated equipment, and defensible results,” explains Morales. “Our team brings together licensed electrical engineers, engineers, and certified electricians committed to technical excellence, safety, and dependable service. We approach every project with precision, accountability, and attention to detail.”

“Becoming Puerto Rico's first NETA QEMC is a significant milestone—not only for our company, but for the evolution of electrical maintenance practices on the island,” Morales

says. “We operate in an industry where precision protects lives, and we are committed to delivering work based on technical rigor, proven processes, and recognized standards.”

Looking forward, Morales explains, “This qualification reinforces our responsibility to do things the right way and to help improve the consistency and reliability of the systems that support critical operations across Puerto Rico and the Caribbean.”

Morales points out, “This qualification reflects the alignment of our technical capabilities with the NETA framework, reinforcing the credibility of our work and ensuring our services meet recognized industry standards. At HiPot Engineering, we see this as an important step in strengthening the consistency, quality, and reliability of the work we deliver, while continuing to position our company for higher levels of performance within the industry.”

“NETA is proud to welcome HiPot Engineering, LLC, as a Qualified Electrical Equipment Maintenance Company (QEMC),” says Chasen Tedder, NETA QEMC and QEMW Committee Chair. “NETA QEMC-recognized service providers ensure their Qualified Electrical Equipment Maintenance Workers (QEMWs) align with new NFPA 70B requirements and lead the way in meeting the growing demand for electrical power system maintenance services.” **NW**



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## PRISM PSG CERTIFIED AS QUALIFIED ELECTRICAL EQUIPMENT MAINTENANCE COMPANY



From its humble beginnings to its current status as a go-to partner for engineering and electrical services, PrISM's 20-year history is marked by growth, innovation, and a relentless commitment to quality. In 2004, Founder Jeff Pugh saw a need for system integration support in the water/wastewater market and electrical engineering support in the industrial sector in Phoenix, Arizona. Now, PrISM PSG is a leader in engineering and electrical services, dedicated to delivering innovative solutions that exceed client expectations.

PrISM's comprehensive engineering and electrical services are designed to deliver innovative, efficient, and tailored solutions for your specific needs. Whether it's design, analysis, or implementation, our team of experts ensures every project meets the highest standards


of quality and performance. The company also offers power quality, electrical testing, programming, telecom, arc flash services to help customers identify and mitigate arc flash hazards, and LSS services to improve efficiency, reduce energy costs, and extend equipment life, all focused on ensuring compliance with safety regulations and protecting personnel.

Operating out of Chandler, Arizona, PrISM's team of dedicated professionals is passionate about precision, quality, and safety and boasts a diverse portfolio of experience spanning various industries. Offering a dynamic work environment where innovation and growth are encouraged, PrISM believes in fostering a culture of collaboration, learning, and development, where every team member has the opportunity to thrive.

Prism PSG's mission is to empower its clients with top-tier engineering services that drive success and sustainability. The company believes in continuous learning and staying at the forefront of industry trends to deliver the best solutions for its clients. It envisions a future where its innovative solutions lead the industry, setting new benchmarks for quality and efficiency.

"Integrity, innovation, and quality are at the core of everything we do," says owner Jeff Pugh. "These values guide our decision-making and define our approach to every project. We believe in building long-lasting relationships with our clients, grounded in trust and mutual respect, and being recognized as a NETA QEMC is a testament to our quality culture and drive for excellence."

"NETA is proud to recognize Prism PSG as a new NETA Qualified Electrical Equipment

Maintenance Company (QEMC)," says Chasen Tedder, NETA QEMC and QEMW Committee Chair. "As NETA QEMC-recognized service providers like Prism ensure their Qualified Electrical Equipment Maintenance Workers (QEMWs) align with new NFPA 70B requirements, they lead the way in meeting the growing demand for electrical power system maintenance services." 



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# ANSI/NETA STANDARDS UPDATE

## ANSI/NETA MTS-2023 REVISION UNDERWAY

The next revision cycle for the ANSI/NETA MTS-2023, *Standard for Maintenance Testing Specifications for Electrical Power Equipment and Systems*, is underway. To support this process, the NETA Standards Review Council will convene a series of working groups composed of subject matter experts from across the industry. These working groups are to pilot a new approach to early-stage comment review. This beta initiative will also serve to refine procedures in preparation for the upcoming revisions of other ANSI/NETA standards. The ballot pool canvassing process begins May 4, 2026.

New content to include the following sections:

- 7.28 Battery Energy Storage Systems (BESS)
- 7.29 Solar Photovoltaic (PV) Systems
- 7.30 Wind Turbine Systems

The ANSI/NETA MTS-2023 standard establishes specifications for field testing and inspections to evaluate the continued serviceability and reliability of electrical power equipment and systems. These specifications help ensure that tested equipment operates within applicable industry standards and manufacturers' tolerances and remains suitable for continued operation.

Key updates in the 2023 edition included a comprehensive overhaul of the Cables section and the introduction of a new section addressing Electric Vehicle Charging Systems, reflecting evolving technologies and industry needs. ANSI/NETA MTS-2023 is available for purchase at the NETA Bookstore at [www.netaworld.org](http://www.netaworld.org).

## ANSI/NETA ETT-2026 NEW STANDARD REVISION APPROVED

The revision of ANSI/NETA ETT-2022, *Standard for Certification of Electrical Testing Technicians*, was approved by the American National Standards Institute (ANSI) on



# SPECIFICATIONS AND STANDARDS ACTIVITY

December 1, 2025. Among the key updates is a revised Detailed Content Outline (DCO) for ETT Levels 2–4.

The ANSI/NETA ETT standard defines the minimum qualifications for electrical testing technicians, including requirements for certification, training, and experience. It also outlines the criteria for documenting these qualifications and specifies the standards for an independent and impartial certifying body.

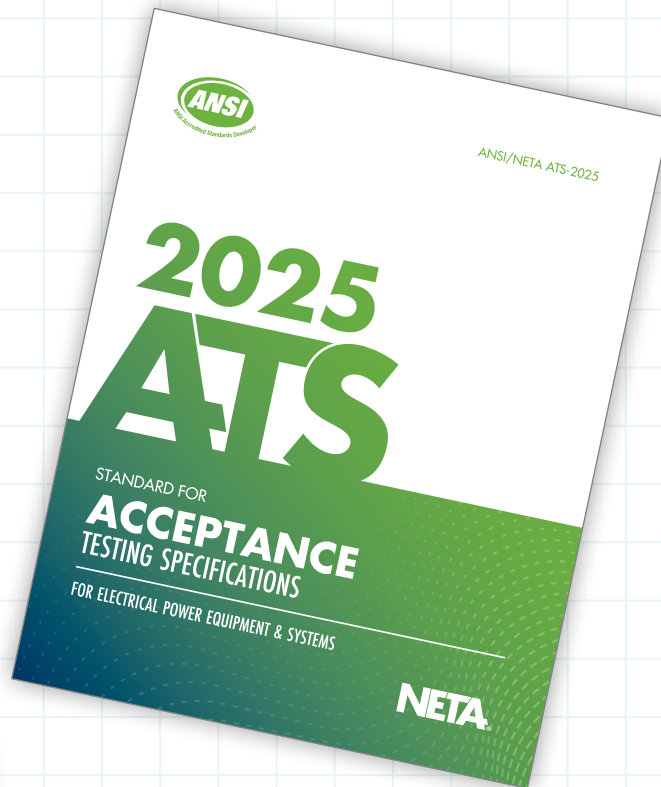
of QEMWs, including training and experience prerequisites along with the necessary knowledge, skills, and abilities to perform maintenance in alignment with industry best practices, ensuring safety, consistency, and reliability across electrical equipment maintenance practices.



## ANSI/NETA EMW-2026 NEW STANDARD APPROVED

ANSI approved ANSI/NETA EMW-2026, *Standard for Qualification of Electrical Equipment Maintenance Workers for Electrical Power Equipment & Systems*, on January 6, 2026. This new standard is in support of NFPA 70B, *Standard for Electrical Equipment Maintenance*, which meets the qualification requirements outlined in that standard for Qualified Electrical Equipment Maintenance Workers (QEMW).

The ANSI/NETA EMW standard defines the minimum requirements for the qualification



## ANSI/NETA ATS-2025

The ANSI/NETA ATS-2025, *Standard for Acceptance Testing Specifications for Electrical Power Equipment and Systems*, received formal approval from the American National Standards Institute (ANSI) on February 20, 2025.

This standard defines the field tests and inspections recommended to evaluate the suitability of electrical power equipment and systems prior to their initial energization. These specifications are designed to confirm that equipment is properly installed in accordance with design requirements, is operational, and performs within applicable industry standards and manufacturers' tolerances.

# SPECIFICATIONS AND STANDARDS ACTIVITY

The 2025 edition introduces significant new content, including:

- Section 7.28 Battery Energy Storage Systems (BESS)
- Section 7.29 Solar Photovoltaic (PV) Systems
- Table 100.6 Medium-Voltage Cables Acceptance Test Values (Tables 100.6.1–100.6.6)
- Appendix B Guidance for Circuit Reliability Considerations for Medium- and High-Voltage Cable Testing Methods (pictured below).

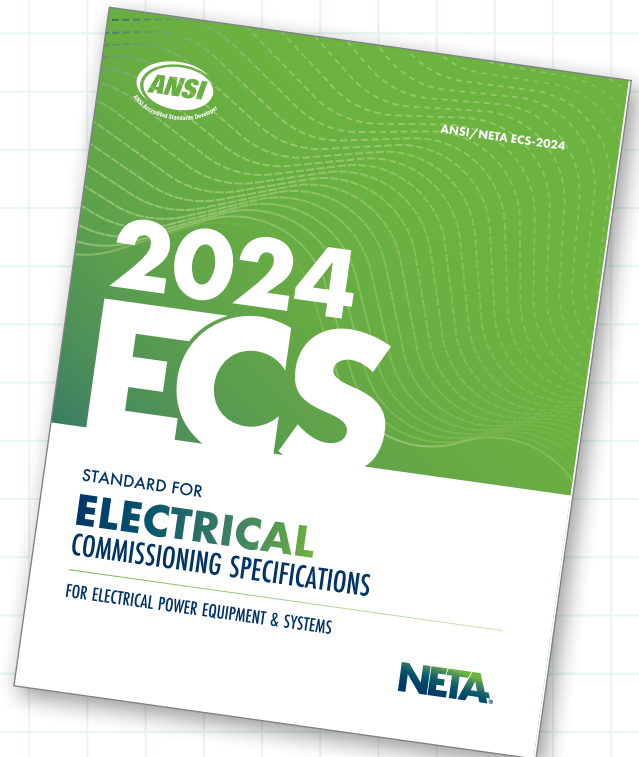
A notable revision in ANSI/NETA ATS-2025 is found in Section 7.4.D.2.a-b. Metal-Enclosed Busways. This update introduces separate formulas for low-voltage and medium-voltage systems and replaces the previous nominal 1,000-foot run length with the actual busway length in feet, enhancing the applicability of testing procedures.

ANSI/NETA ATS-2025 is available for purchase through the NETA Bookstore, offered in bound print, PDF download, and a Redline PDF (with all changes highlighted) download.

## ANSI/NETA ECS-2024

ANSI/NETA ECS-2024, *Standard for Electrical Commissioning of Electrical Power Equipment & Systems*, 2024 Edition, completed the American National Standard revision process. ANSI administrative approval was received on July 2, 2024. ANSI/NETA ECS-2024 supersedes the 2020 Edition.

ANSI/NETA ECS describes the systematic process of documenting and placing into service newly installed or retrofitted electrical power equipment and systems. This document shall



be used in conjunction with the most recent edition of ANSI/NETA ATS, *Standard for Acceptance Testing Specifications for Electrical Power Equipment & Systems*. The individual electrical components shall be subjected to factory and field tests, as required, to validate individual components. It is not the intent of these specifications to provide comprehensive details on the commissioning of mechanical equipment, mechanical instrumentation systems, and related components.

The ANSI/NETA ECS revision includes the following new sections for Source-Specific Systems Commissioning: Photovoltaic (PV), Uninterruptible Power Supply (UPS), and Automatic Transfer Switches (ATS). [N74](#)

*Tania Brammer is NETA's Director of Technical Operations.*

## PARTICIPATION

Comments and suggestions on any of the standards are always welcome and should be directed to NETA. To learn more about the NETA standards review and revision process or to purchase these standards, please visit [www.netaworld.org](http://www.netaworld.org). To get involved, recommend revisions, or be considered for ballot pools, please visit <https://www.netaworld.org/standards/standards-development> or contact the NETA office at 888-300-6382.

# IEEE TRANSFORMERS COMMITTEE REPORT

BY SCOTT REED, MVA

The IEEE Transformers Committee has been very active this past year, with back-to-back record attendance for the fall and spring meetings. In March, 659 people from around the world met in Texas to help develop transformer standards and guides as the U.S. power industry continues to remain a key interest globally.

## INSULATING FLUIDS SUBCOMMITTEE:

This subcommittee has been very active and is scheduled to publish multiple guide revisions and a new guide this year. Following is a partial list of the activities.

### C57.166

C57.166 is the new guide for the *Acceptance and Maintenance of Insulating Liquids*. It is a consolidation of all fluid-quality testing and will also include synthetic esters. This guide is out for publication and will replace the following guides: C57.106, *IEEE Guide for Acceptance and Maintenance of Mineral Insulating Oil in Electrical Equipment*; C57.147, *IEEE Guide for Acceptance and Maintenance of Natural Insulating Liquid in Transformers*; C57.111, *IEEE Guide for Acceptance of Silicone Insulating Fluid and its Maintenance in Transformers*; and C57.121, *IEEE Guide for Acceptance and Maintenance of Less-Flammable Hydrocarbon Fluid in Transformers*.

It's important to note that with this revision, the ASTM D-877 dielectric test for in-service transformers is no longer approved for analyzing the fluid. The ASTM D-1816 methodology is the only approved dielectric test.

### C57.146

The working group for C57.146, *IEEE Guide for Interpretation of Gasses Generated in Silicone-Immersed Transformers*, has completed the guide revision after analyzing approximately 165,000 dissolved gas samples. It has established new threshold limits similar to C57.104 (for mineral oil DGA) for the 90th and 95th percentile values of each dissolved gas. The revision is awaiting publication.

### C57.637

The working group for C57.637, *IEEE Guide for the Reclamation and Reconditioning of Insulating Liquids*, has finalized the revision and is expanding beyond mineral oil to include natural esters, synthetic esters, silicone, and less flammable hydrocarbons. This guide references the C57.166 guide; after C57.166 is published, the approval process for C57.637 will resume so it can be published this year.

## BUSHINGS SUBCOMMITTEE

The working group for C57.19.01, *IEEE Standard for Performance Characteristics and Dimensions for Power Transformer and Reactor Bushings*, voted to go to ballot for the guide revision.

# SPECIFICATIONS AND STANDARDS ACTIVITY

The working group for C57.19.04, *IEEE Standard for Performance Characteristics and Dimensions for High Current Power Transformer Bushings with Rated Continuous Current in Excess of 5000 A in Bus Enclosures*, has also completed its first ballot and received 100% approval.

A presentation made during the Bushing Subcommittee raised the concern about C1 power factor variances that occur during transformer installations compared to the factory nameplate data. A motion was made and accepted to form a task force to explore the concept of determining what is considered acceptable for bushing testing on new installations.

## DRY-TYPE TRANSFORMERS SUBCOMMITTEE:

The Dry-Type Transformers Subcommittee has also been very active. Six of the 14 standards are under revision and are expected to be published this year. Following is a list of those under review.

- IEEE C57.12.01, *Standard for General Requirements for Dry-Type Distribution and Power Transformers*, has gone to ballot and is undergoing comment resolution to address negatives to the ballot.
- IEEE C57.94, *IEEE Recommended Practice for Installation, Application, Operation, and Maintenance of Dry-Type Distribution and Power Transformers*, has been approved and is awaiting publication.
- IEEE C57.12.59, *IEEE Guide for Dry-Type Through-Fault Current Duration*, is preparing to go to ballot by the working group for approval and commenting. It is expected to be approved for publication later this year.
- IEEE C57.12.91, *IEEE Standard Test Code for Dry-Type Distribution and Power Transformers*, is awaiting IEEE approval before it can be published.

- IEEE C57.96, *IEEE Guide for Loading Dry-Type Distribution and Power Transformers*, has gone to ballot and comment resolution. The working group is preparing for the recirculation of the guide revision.
- IEEE C57.16, *IEEE Standard for Requirements, Terminology, and Test Code for Dry-Type Air-Core Series-Connected Reactors*, has been approved and is awaiting publication.

## OTHER INTERESTING IEEE COMMITTEE UPDATES FOR NETA MEMBERS

### C57.152

Within the Standards Subcommittee, C57.152, *IEEE Guide for Diagnostic Field Testing of Fluid-Filled Power Transformers, Regulators, and Reactors*, has been approved for publication. The purpose of this guide is to provide users with a document on what electrical testing should be performed throughout the life of a transformer. It is expected to be published by this fall.

### C57.93

Within the Power Transformers Subcommittee, a revision to C57.93, *IEEE Guide for Installation and Maintenance of Liquid-Immersed Power Transformers and Reactors*, is underway. An addendum to C57.93 was added this past year. The addendum is a cold start-up procedure for natural-ester liquid-filled power transformers for freezing temperature conditions. Since natural esters have such a high pour point, the fluid solidifies under extreme freezing conditions. [MVA](#)



**Scott Reed** is President of MVA and is very active with the IEEE Transformers Committee, where he serves as Vice Chairman. He holds three U.S. Patents, has written and published various papers, and regularly speaks at NETA's PowerTest conferences. Reed earned a BS in electrical engineering from North Carolina State University.

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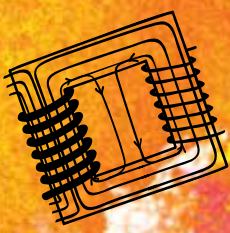
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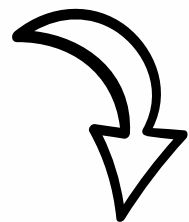
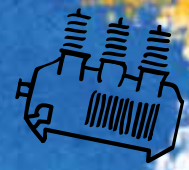
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...portable, true three-phase test system that supports all of the common and advanced diagnostic tests on windings and tap changers done on power transformers. With just one setup for multiple tests, TESTRANO 600 significantly reduces the wiring effort, enhances safety and optimizes the total testing time.

Its specially designed power amplifiers ensure a new level of accuracy, and the multi-touch color display enables smart and comfortable operation in addition to operation via PC based PTM software.

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