



Barry C. Brusso

The IAS Electrical Safety Workshop: Celebrating 30 Years of Changing and Advancing the Electrical Safety Culture

Lanny Floyd and Daniel Doan, Guest Authors

This year is the 30th anniversary of the IEEE Industry Applications Society (IAS) Electrical Safety Workshop (ESW), which grew out of an initiative dating to the 1960s, when a core group of IAS members began collaborating on new approaches to control the risk of serious and fatal injuries involving industrial electric power systems. In 1969, Ralph Lee presented a groundbreaking paper, “Electrical Safety in Industrial Plants,” at the IAS Annual Meeting. The paper was published in the June 1971 issue of *IEEE Spectrum* and stimulated collaboration in the Maintenance, Operation, and Safety (MOS) Subcommittee of the IAS Power Systems Engineering Committee. In the late 1960s, Bill Jordan designed and implemented an arc flash injury prevention program at one of the largest industrial complexes in North America. In 1981, Lee presented a second landmark paper, “Arc Flash, the Other Electrical Hazard,” at the IAS Annual Meeting in Philadelphia.

.....
 Digital Object Identifier 10.1109/MIAS.2022.3155258
 Date of current version: 7 April 2022

By the early 1980s, the MOS Subcommittee had three initiatives underway: advocacy for a new U.S. Occupational Safety and Health Administration (OSHA) regulation on electrical safe work practices for general industry, contributing to a revision of the National Fire Protection Association (NFPA) 70E standard on workplace electrical safety to include safe work practices, and development of a new IEEE standard, *Guide for Maintenance, Operation, and Safety of Industrial and Commercial Power Systems*. A half-day symposium, “Prevention of Arc Flash Injuries,” organized by the MOS Subcommittee for the 1989 IAS Annual Meeting in San Diego, set the wheels in motion to establish a stand-alone conference on occupational electrical safety. The symposium was organized and moderated by Lanny Floyd, from DuPont, and featured presentations by Bill Jordan, Dow Chemical; Bruce McClung, Union Carbide; John Moore, ElectroTest; Thad Brown, Bath Electric; and Thad Masters, DuPont. Jordan, McClung, Brown, and Moore were pioneers in applying engineering

design, safe work practices, and flame-resistant protective clothing to prevent arc flash events and protect workers from extreme thermal energy. Masters was an expert in the development of flame-resistant fabrics used in personal protective clothing. The symposium reaffirmed the commitment of the MOS Subcommittee to advocate for federal regulation, expansion of safe work practices in NFPA and IEEE standards, and stimulating innovation in equipment and system designs to reduce the risk of arc flash injuries.

Organizing the First ESW

In 1991, the IAS Petroleum and Chemical Industry Committee (PCIC) appointed Don Vardeman and Floyd to organize the PCIC Safety Subcommittee with an objective to inform PCIC members of steps to comply with new OSHA regulations on electrical safe work practices for general industry. The expectation of the PCIC leadership was that the subcommittee would organize three papers at the annual PCIC conference to help members meet the requirements. Vardeman and

Floyd felt that the real opportunity to advance electrical safety was to look beyond compliance with the regulations and stimulate innovation in technology, managing systems, and safe work practices. They were inspired by a concept that was proving successful in the new frontier of deep-water oil and gas exploration.

Established and traditional methods for oil and gas extraction on land and in shallow water would not work for deep water. To overcome this barrier, workshops were organized, bringing together experts from drilling and other technologies to change paradigms limiting progress. The emphasis was on innovation and creativity rather than traditional methods. Vardeman and Floyd believed that a similar approach could accelerate change that could dramatically impact the prevention of electrical injuries. At the first meeting of the PCIC Safety Committee, in September 1991, in Toronto, they presented their proposal for an ESW focusing on innovations in the prevention of electrical injuries. The reaction was overwhelmingly in favor, and the first workshop was held in Dallas in spring 1992.

The first ESW featured six of the seven speakers from the 1989 IAS Symposium on Arc Flash. Thirty-seven attendees from 20 companies met for 2.5 days and left with the following objectives: to promote the concept of National Electrical Safety Week in May, to raise general awareness of electrical safety; contribute proposals to the 1995 revision of NFPA 70E; stimulate education about prevention of arc flash injuries; and support sharing incident and near-miss case histories as learning opportunities to better understand contributing factors.

1995–2011: The Growth Years

Early on, the ESW was overseen by a working group under the PCIC Safety Subcommittee. Initially, the working group consisted of Floyd, Kim Eastwood, David Pace, and Danny Liggett. Soon, others began stepping

forward to work on the ESW. The working group continued to grow, and the PCIC separated the ESW from the subcommittee to establish the PCIC Electrical Safety Workshop Subcommittee. Liggett was appointed as chair, Pace was named the vice-chair, and Eastwood was made the secretary.

The vision for the growth of the ESW drew from the dedication of its early leaders. Eastwood attended the first ESW and quickly became part of the leadership team. She recalled

why she was so committed to making sure the ESW would become a sustaining force in advancing electrical safety:

When I was 16 years old, I started working part-time at a freight delivery company. One afternoon, I answered a phone call from the local law enforcement requesting to speak to the manager. The officer stated that one of our employees had been injured, and they held for a few minutes for the manager.



Bill Jordan discusses arc flash protective clothing at ESW 1992, in Dallas. (Source: Don Vardeman; used with permission.)



Bruce McClung speaks at ESW 1995, in San Antonio. (Source: Kim Eastwood; used with permission.)



The general session at ESW 2020 shows the growth in attendance. (Source: Kristy Black; used with permission.)

When the manager took the call, he found out that one of our drivers had been electrocuted when an overhead power line had fallen onto his truck. He asked me to check with the dispatcher to see which driver was involved. This was a small business, and the employees were all very close and frequently socialized together. The driver was Tim, the manager's younger brother. Tim was also my friend, and his death saddened me, and the experience was exacerbated by taking that phone call and being present when the manager realized the victim was his brother. I will not forget this tragic day.

In 1992, I was working for a different company as a safety manager in our construction division. One of the executives recommended that I attend a workshop on electrical safety organized by the PCIC. I learned so much about electrical safety during those three days and was highly inspired by the initiative to promote electrical safety awareness. The slogan, "Take Electricity Seriously," always reminded me of Tim's death, and I often wondered about safety training back in those days and if he was even aware of the dangers that crossed his path. Throughout my years of leadership and involvement with the ESW, I continually initiated

electrical safety awareness promotions at my company, in my community, and with my relatives by providing home inspection checklists.

Pace also attended the first ESW and helped develop the workshop's mission, strategies, and slogan, "Changing the Electrical Safety Culture." He recalled his early experiences:

When I started working in the late '70s, there weren't many rules. Safety just didn't have nearly the emphasis that it does today. I suffered several shock injuries and one arc flash injury that thankfully left only minor permanent damage. In 1990, I was tasked with leading an effort to develop electrical safety policies for our company. Tom Dye, our principal electrical engineer for Olin at the time, told me of an electrical safety workshop he learned about at the PCIC conference. I attended and was overwhelmed with what I found. It opened up a world I never knew existed. I was introduced to NFPA 70E. I was introduced to arc flash hazards. I met Georgette, a female mannequin who wore the latest technology in arc flash clothing. And I was introduced to people who were some of the most knowledgeable and experienced there were in the field of electrical safety. They included the likes of Bruce McClung, Ray Jones, Lanny Floyd, and others who



The ESW Products and Services Exposition facilitates collaborative discussions, which have helped stimulate advances in the development and application of electrical safety-related technologies. (Source: Anthony Capkun; used with permission.)

were rich in information in varying areas of electrical safety.

I also met Bill Jordan, who worked for the Dow Chemical Company facility in Freeport, Texas. At that time, the Freeport operation was the largest industrial complex in the western hemisphere and had very sophisticated safety practices. Bill had led the development of an advanced electrical safety management program. He had arc flash protection requirements in place, something unheard of at the time. He had a handheld instrument company design and manufacture a “safer” multimeter. He had developed an early version of the concept of insulated tools and equipment. He had significantly reduced electrical injury risk at Dow and was continually looking for ways to continue improving the program. I asked him for help with developing our electrical safety policies and procedures, and he agreed without hesitation.

He arranged for me to visit him at the Dow facility, something that was nothing short of a miracle because Dow and Olin were direct competitors in business. In those days, visits inside each other’s facilities were strictly prohibited to avoid each from getting process or equipment information from the other. But Dow management had enough confidence in Bill they granted his request for me to visit him. Over the course of two visits to the site, he showed me everything he had developed and implemented at Dow. He gave me copies of every document he had related to electrical safety. He helped me through many phone calls and never complained or hesitated.

I learned later that I was not the only ESW attendee Bill had taken under his wing. Today,

the electrical safety program at Olin, including all of the policy and procedure requirements, is based on those he gave me and the help he and others provided. And he became a good friend over the many years we knew each other. For me and others in the ESW leadership, Bill was the role model of what we wanted the ESW to become. His passion was the basis for the creation of the Founders Award in 2008.

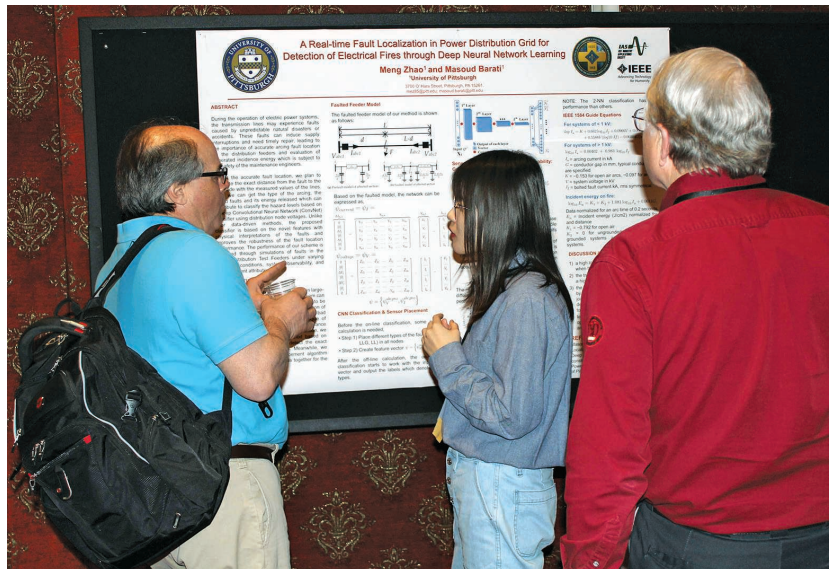
Liggett attended the second ESW, in 1995, and soon became part of the leadership for the workshop and the Electrical Safety Workshop

Subcommittee, and in 2012, he was named the first chair of the Electrical Safety Committee. Liggett recalled what motivated his contributions and leadership:

In the 1980s, three events occurred to electricians working for me. In separate incidents, two electricians received arc flash burns that required a lengthy stay in a burn unit and time away from work. Neither was ever the same again. At the time, I didn’t understand what an arc flash was. In a third incident, an electrician was electrocuted. He was a knowledgeable electrical foreman. The



Attendees’ rapt attention at ESW 2013 demonstrates that the Technical Program Committee selects high-interest topics for presentation. (Source: Anthony Capkun; used with permission.)



The Prevention Through Design Engineering Student Initiative enables graduate students to present technology impacting electrical safety. (Source: Rene’ Graves; used with permission.)

hardest thing I ever did was to tell that man's wife that he wasn't coming home. These events caused me to look at myself, and what I saw was someone who thought he knew about electrical safety but really didn't. Attending my first ESW, I knew this was the place to learn about electrical safety, not just for me but for others like me who wanted to know more but were not able to find the right venue to do so. Some very knowledgeable people attended the ESW, and I learned so much there. The ESW was rich with networking opportunities. When the opportunity to assist with the ESW arose, I jumped at the chance to help. As the ESW grew, I saw there was a tremendous thirst for what the ESW had to offer. Not being a formally educated electrical engineer, I saw this as a way to give back to those who had taught me so much. I did not want others to go through what I had been through.

Steve Wilson attended his first ESW in Indianapolis in 1998. He was

an electrical maintenance supervisor for Dofasco, a Canadian steel company that had been undergoing a major restructuring to be more competitive. As part of the overhaul, he was leading the standardization of best practices in electrical safety across all business units. He recalled his experience:

When I attended my first ESW, I was amazed at the caliber of people who attended and participated in the discussions. The people who attended this event were the people who sat on the code panels and IEEE standards, and it amazed me how down-to-earth they were. Here were the most knowledgeable people in electrical safety in North America, and they treated everyone as friends. There were engineers, electricians, medical doctors, scientists, and even lawmakers, all in one room with one mission, to advance the electrical safety culture in the workplace. Like a lot of people, by attending my first ESW, I was hooked and needed to keep attending.

With the information that I brought back, my supervisor

was in favor of me attending again, so off I went to San Diego for ESW 1999. At each subsequent workshop, I watched the members of the organizing committee. Not only were they participating in the presentations but they were also making sure that everything ran smoothly. I was amazed by the work that went on behind the scenes by these people who were volunteers. In 2001, the ESW was in Toronto, about an hour's drive from our company. I offered to help in any way I could. I was asked to be part of the organizing committee for ESW 2003 in Houston and continued on and became the chair for ESW 2005 in Denver.

Over the years, I have learned a lot of valuable information that I have been able to share with others. This has not just been technical information but how to network with others. Over the next 25 years, I hope that other individuals will still be attending their first ESW and getting something out of it that they can use at work and in life. I retired from work in 2008 but still consider the ESW an important part of my life. My wife likes to tell people that this is my hobby. I don't collect trains or antique cars; I like to volunteer my time through the ESW.

Others were equally tireless in their leadership and contributions to enable the ESW to grow in attendance, reputation, and influence. Mary Capelli-Schellpfeffer, an occupational physician, joined the planning committee in 1995 and connected the ESW to centers of medical research in the evaluation and treatment of electrical injuries. In 1998, Shahid Jamil led the organization of the first ESW to be held outside Texas, ESW 1998 in Indianapolis, and with Satish Chaparala, organized an ESW in Madras, India.



Some of the ESW past chairs gathered to honor Bruce McClung, the first recipient of the William C. Jordan Award. Front row, from left: Lanny Floyd (1992 and 2003), Bruce McClung, Kim Eastwood (1996), and Hugh Hoagland (2015). Back row, from left: Daniel Doan (2013), Marcelo Valdes (2014), Dennis Neitzel (2012), Steve Wilson (2005), David Pace (1999), Dennis Hill (2016), Mike Doherty (2007), Eva Clark (2011), Jim White (2008), and Joe Rachford (2010). (Source: Rene Graves; used with permission.)

The slogan “Changing the Electrical Safety Culture” first appeared in promotional materials. In 1999, the event was renamed the IAS Electrical Safety Workshop to reflect that its scope was broader than the petroleum and chemical industries. Eastwood led the creation of the medallion logo, which was unveiled at ESW 2003, in Houston. Luiz Tomiyoshi and Estellito Rangel Jr., who were active in the IEEE South Brazil Section, organized an ESW in Brazil in 2003, which has been held biannually since.

Charlie Hoy and Scott Seaver led the expansion of tabletop displays of products to a full-scale products and services exposition at ESW 2003. As chair of ESW 2004, in Oakland, Ray Crow incorporated a tutorial program. In 2007, Daniel Doan paved the way for papers presented at the ESW to be eligible for publication in *IEEE Transactions on Industry Applications* and *IEEE Industry Applications Magazine*. The awards program was launched in 2008, with the presentation of the ESW Founders Award to Jordan. The recognition was later renamed the Electrical Safety Committee William C. Jordan Award. In 2010, Pace led strategic planning to establish 16 subcommittees under the umbrella of the ESW as a way to better engage workshop participants and enable more contributions to the mission.

2012: The IAS Electrical Safety Committee Is Formed

In 2011, IAS President Bruno Lequesne, PCIC Chair John Nelson, and Electrical Safety Workshop Subcommittee Chair Liggett began discussions to create a new IAS committee. The IAS Electrical Safety Committee was formally approved by the IAS Executive Committee in May 2012, with Liggett as chair, Pace as vice-chair, and Wilson as secretary. The scope of the committee includes all matters within the IAS in which the emphasis or dominant factor specifically relates to occupational hazards of electrical energy. Topics

include, but are not limited to, hazard phenomena, inherently safer design, work practices, hazard mitigation, and electrical safety management. The committee has the objectives of 1) advancing state-of-the-art methods and technologies that contribute to the prevention of occupational electrical incidents and injuries, and 2) promoting and supporting electrical safety activities in IAS committees, technical activities, and IAS Chapters.

From its roots in the Power Systems Engineering Committee Maintenance, Operations, and Safety Subcommittee and the Petroleum and Chemical Industry Committee Safety Subcommittee, the Electrical Safety Committee has built a global network of thought leaders and practitioners who continue its mission to “change the electrical safety culture.” The electrical safety community that the committee has nurtured extends beyond the electrical engineering constituency of IEEE and the IAS and includes safety professionals, physicians, educators, attorneys, standards developers, print media, electricians, government regulators, and others. The relationships have influenced and accelerated advancements in inherently safer equipment designs, hazard analysis methodologies, codes and standards, and other efforts aimed at preventing occupational electrical mishaps, injuries, and fatalities.

Building on the ESW growth years, the Electrical Safety Committee



The logo for the Electrical Safety Committee and the ESW. Original design by Codie Smith.

has continued to expand its programs to change and advance the electrical safety culture. In 2013, Anna Floyd proposed and organized the Prevention Through Design Student Initiative, which invited M.S. and Ph.D. engineering students to submit paper proposals for designs that reduce the risk of electrical injuries. Accepted proposals were presented in a poster session, with papers reviewed for potential publication in *IEEE Transactions on Industry Applications*. The same year, Eva Clark organized, and she continues to lead, an expansion of the technical program, which added papers presented in a poster format rather than an oral presentation. The poster presentations, identified as focus sessions, enabled the technical program to expand without adding significant time to the ESW schedule. In 2015, Payman Daghalian, one of the original students, took over the leadership of the Prevention Through Design Student Initiative and continues to manage the program.

The Occupational Safety Subcommittee, under the leadership of Rene' Graves and Jeremy Presnal, provides a forum for safety professionals to share expertise in hazard identification, risk assessment, and safety management systems. In 2017, the Construction Subcommittee, under the leadership of Mike Doherty, presented a half-day seminar on electrical safety in construction for the National Academy of Construction, in Washington, D.C. In 2018, the Standards Subcommittee held its first meeting under the leadership of Arthur Smith. In addition to supporting safety standards working groups sponsored by other IAS committees, new standards sponsored by the Electrical Safety Committee are under development. Marcelo Valdes, chair of the International Subcommittee, worked with German Moya, of the IEEE Costa Rica Section, to organize an ESW in San José, Costa Rica, in May 2019.

The awards program has expanded to include five prizes recognizing

outstanding leadership and contributions to the Electrical Safety Committee and best paper awards for papers presented at the ESW. In 2019, Rachel Bugaris led the initiative to leverage ESW presentations through the monthly IAS webinar series. In response to challenges stemming from the pandemic, Kevin Lippert, Seaver, Dennis Hill, and Wilson led the planning to enable a 100% virtual format for ESW 2021.

The Future

The ESW was founded and has evolved to be different from any other electrical safety meeting, seminar, or conference. It provides a unique forum where long-held beliefs are challenged and hidden opportunities explored. The mission to change and advance the electrical safety culture continues to focus on the following three areas:

- accelerate the application of breakthrough improvements in human factors, technology, and managing systems that reduce the risk of electrical injuries
- stimulate innovation in overcoming barriers.
- change and advance the electrical safety culture to enable sustainable improvements in the prevention of electrical accidents and injuries.

The Electrical Safety Committee has built on 30 years of success in advancing the ESW mission by organizing its activities along three strategic workstreams, as follows:

- providing forums for people to meet and exchange ideas for preventing electrical accidents and injuries in the workplace
- accelerating advancements in the development and application of technology, work practices, standards, and regulations
- linking professionals and centers of excellence in industry, engineering, government, and medicine.

Doan attended his first ESW in 2002 and was impressed by the technical advances in safety that were showcased. He began contributing with tutorials, technical presenta-

tions, and especially papers, publishing several in the transactions and magazine. He also contributed by running ESW registration; when the committee was formed, he picked up the role of paper review chair, working with ScholarOne. Doan is the committee chair for 2021–2023 and excited about the future:

The Electrical Safety Committee is a unique organization within IEEE and IAS, with connections across many occupations and at all levels of experience. You will find student engineers as well as retired principal engineers, electricians just beginning, experienced job leaders, and early career safety professionals along with safety consultants having decades of experience, all working together on the committee and networking and learning from each other at the ESW. It inspires me that the efforts seen here can have a wide impact and can save the lives of workers in the field. In the future, I see the committee expanding outside the box of the annual ESW by developing more connections throughout IEEE and IAS, adding to the safety body of knowledge, and finding ways to have an impact globally. For example, we are connecting with the IEEE Smart Village to help ensure electrical safety is considered in the design and installation of their projects. We are actively looking for ways to collaborate with other societies and communities within IEEE, where we can contribute our focus on safety and where we can learn how to be a better and stronger committee.

Bugaris attended her first ESW in 2010 and quickly started contributing technical papers and presentations. She is the vice-chair of the committee and provided her thoughts for the future:

One of the things that set this committee/workshop apart from other professional organi-

zations is the effort that is made to bring together multiple perspectives. At any committee event, you will be sitting next to someone passionate about electrical safety, but they may not be an electrical engineer. You're just as likely to meet safety professionals, facility managers, learning and training specialists, manufacturing personnel, consultants, academic researchers, medical doctors, maintenance workers, and electricians as you are engineers. Working together to advance electrical safety culture is what sets this organization apart.

As technology continues to advance, I'm hopeful that this will have a positive impact on electrical safety in ways we may not even be able to imagine yet. New technology can bring opportunities to address the most challenging problems with tools and methods that have not previously been possible. The work of the committee and workshop leaders to instill prevention through a design mindset positions our industry well to leverage advancements in electrical safety technology for new and improved safety processes. As the committee grows, I'm looking forward to bringing focused attention to areas that are often overlooked. An example of this is the ad hoc committee led by Mark Scott to generate initiatives and awareness of the consequences of electrical shock. There is an opportunity to address the tolerance in our safety culture around this issue, and the committee and the ESW are good forums to generate action in an area like this.

Valdes was chair of ESW 2014 and the first recipient of the Excellence in Prevention Through Design Award. He provided his vision for the future:

The one thing that is constant is change ... When one seeks

to be the best at what one does, one must keep up with that change, and change creates opportunities. Going forward, the ESW will always be the place where you learn about the changes that have taken place and how to best react to ensure that you and your organization are keeping up and using them to promote safety and compliance. But the ESW is more than that opportunity. The ESW is where that change starts. This is where the thought leaders of today and tomorrow meet, where tomorrow's expectations, goals, and methods to achieve electrical safety are created, discussed, fine-tuned, taught, and learned. For producers of products and solutions, the ESW is where they will come to learn about what their next

products need to be, what the solutions the market needs must be. For those that create the standards, this is where the next unaddressed safety problem will be discussed and where past solutions are understood, analyzed, and improved so past experience can light the way for the future. For practitioners, the ESW will always be where you can go to learn from the best because the best will always gather at ESW.

Research has shown that economies and societies that value and prioritize worker safety are more productive. In some parts of the world, labor organizations and government-based health and safety departments have created and driven modern worker safety standards; in others, modern

standards for worker safety are still developing. The ESW will provide a place where ideas from across the globe can be shared, where not only one organization's experience is another organization's textbook but where safety leaders from one country can learn from the experience of other countries and organizations. The ESW has provided impetus and resources to organize successful safety conferences in Brazil, Central America, and India. The committee is always looking to expand its reach beyond North America and hopes to do so more in the future.

To learn more about the ESW and the Electrical Safety Committee and its subcommittees, visit the Electrical Safety Committee website at <https://site.ieee.org/ias-esafc/>.



IEEE Membership Can Help You Reach Your Personal and Professional Goals



Gain access to the latest IEEE news, publications and digital library. Give and receive personal mentoring. Network locally and globally with IEEE members. And that's only the beginning. Discover how IEEE can help jumpstart your career.

"Participating in IEEE has developed me as a well-rounded engineer and helped me shine during networking events."

-Likhitha Patha

Electrical Engineering Student, IEEE Brand President, Virginia Polytechnic Institute and State University

Visit www.ieee.org/join today.

