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Summary of the 2024 IAS Electrical Safety Workshop and Developments in Understanding of DC Electrical Hazards

The 2024 IEEE Industry Applications Society (IAS) Electrical Safety Workshop (ESW) was held in early March, in Tucson, AZ, USA, chaired by Jay Prigmore. More than 570 attendees from 22 countries participated in presentations on a wide variety of electrical safety topics, and a vendor expo highlighted safety products and equipment. Tutorials on a range of topics were available for attendees before and after the workshop.

Congratulations to the 2024 recipients of the following IAS Electrical Safety Committee awards: the H. Landis Floyd Outstanding Service Award was presented to Paul Sullivan, the Excellence in Prevention Through Design Award was given to Nehad El-Sherif, the Technical Achievement Award was presented to the team of Marcia Eblen and Tom Short, and the Young Professional Achievement Award was given to Daniel Majano.

The 2024 ESW conference record, consisting of 33 technical articles, should be available on IEEE *Xplore* by the time you receive this issue. The 2025 ESW is scheduled for 3–7 March 2025, in Jacksonville, FL, USA, and will be chaired by Zarheer Jooma.

In conjunction with ESW 2024, the IAS Electrical Safety Committee's Standards Subcommittee initiated the process of forming working groups for development of the following new safety-related IEEE standards:

1) electrical safety risk assessment
2) electrical vehicle safety and risk assessment
3) stationary battery bank safety and risk assessment.

If you would like to be involved in one or more of these working groups, please watch for upcoming announcements on social media, or monitor the Standards Subcommittee webpage on the IAS Electrical Safety Committee's website, at https://site.ieee.org/ias-esafc/.

These proposed new standards will help to document the application of recent research and the resulting increased understanding of dc shock and arc flash hazards, including those in electric vehicles (EVs) and stationary battery systems. Two papers published in 2024 in *IEEE Transactions on Industry Applications* are of significant interest and show recent research on this topic. Both papers were originally presented at the 2023 ESW.

"Modeling the Dynamic Behavior of DC Arcs," by Dr. Lloyd Gordon [1], provides an overview of today's understanding of dc arc physics and describes models being used to complete dc incident energy calculations. The author reviews recent laboratory studies of dc arc flash under various conditions, evaluates the accuracy of some existing dc arc assessments, and proposes improved methods for modeling the dynamic behavior of these arc incidents.

"Reducing Risk When Performing Energized Work on Batteries," by Dr. David Rosewater [2], studies the development of a safety procedure for mitigating battery hazards to protect workers. The author proposes changes to existing electrical safety practices to meet the special requirements for battery safety.

In addition, the following papers on topics related to dc hazards were presented at the 2024 ESW:

- "Application of DC AF Incident Energy Reference Boundary Area Plots in TCCs Considering Input Parameter Variability," by Albert Marroquin, Raghu Veeraraghavan, Walter Gonzalez, and Marcin Ruta

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David Bredhold. There are more than 10 task groups that meet about 15–20 h total monthly, covering leading-edge technologies for motor protection, including condition monitoring. With new higher-efficiency motor requirements and new motor designs, the motor protection standard is advancing to cover what is on the horizon.

A typical 2-h Task Group meeting will have experts with 200–300 combined years of experience pouring their expertise into the next edition. This is an invaluable opportunity for young engineers to absorb technical information from industry specialists with access to the standards background that is not written in black and white in the final publication. My first experiences with standards meeting highlighted that, "you didn't know what you didn't know until you attended the standards meetings."

Staying Grounded

Throughout my life, God has been my rock and my fortress. I was raised in the church that my great grandmother founded in the early 1900s. I taught Sunday school there and my children were baptized in this church, with several generations of family supporting us. I was on a church board of directors in California and helped as a choir mom in California and Texas. There have been many ups and downs with juggling work, travel, health, and family, however, God has always been there for me.

In service to the community near where I grew up, an old dance hall was for sale in 2007. I purchased the building, converted it to a museum, and open it for the county fair weekend each August. The museum has fossils, family history, and film; preserving the heritage of the local community.

Call to Carry On

Standards are necessary for manufacturing, design, application, and safety. This is a noble pursuit for anyone, regardless of experience level. Standards establish test criteria and document new special test requirements, cover design changes, avoid misapplications, make integration easier among companies, reduce and eliminate safety incidents, and provide better communication, reliability, and efficiency.

Standards development has been the most rewarding experience in my career, where I have met some of the sharpest, most caring, and dedicated people. I would like to take this time to thank everyone who helped me along the way, and I deeply appreciate your mentorship, support, and friendship. Although there have been very few women who have participated in standards development over the years, I am encouraged that more are becoming involved.

References

[1] "Technical report on electric motor prime mover for beam pumping unit service," American Petroleum Institute, Washington, DC, USA, API TR 11L6, May 2008.

[2] "Recommended practice for design, installation, and maintenance of electrical systems for fixed and floating offshore petroleum facilities for unclassified and class I, zone 0, zone 1, and zone 2 locations," American Petroleum Institute, Washington, DC, USA, API RP 14FZ, May 2013.

[3] "Recommended practice for classification of locations for electrical installations at petroleum facilities classified as class I, division 1 and division 2," American Petroleum Institute, Washington, DC, USA, API RP 500, 2023.

[4] J. S. Dudor and L. K. Padden, "Protective relaying on medium and high voltage systems, some lessons to be learned," in *Proc. IEEE Petroleum Chem. Ind. Technical Conf. (PCIC)*, Vancouver, BC, Canada, 1994, pp. 53–61, doi: 10.1109/PCICON.1994.347632.

[5] *Guide for the Application of Electric Machines in Zone 2 and Class I, Division 2 Hazardous (Classified) Locations*, IEEE Standard 1349-2021.

[6] *National Electrical Code*, NEC Standard NFPA 70, 2023.

[7] R. Hoerauf, "Industrial and commercial power systems celebrates its 60th anniversary," *IEEE Ind. Appl. Mag.*, vol. 30, no. 1, pp. 9–13, Jan./Feb. 2024, doi: 10.1109/MIAS.2023.3324446.

[8] *IEEE Recommended Practice for Protection and Coordination of Industrial and Commercial Power Systems (IEEE Buff Book)*, IEEE Standard 242-2001.

[9] *IEEE Recommended Practice for Applying Low-Voltage Circuit Breakers Used in Industrial and Commercial Power Systems [BLUE BOOK]*, IEEE Standard 1015-2006.

[10] L. K. Padden and P. Pillai, "A flow chart methodology for performing low-voltage three-phase motor coordination studies," in *Proc. IEEE Ind. Appl. Soc. 44th Annu. Petroleum Chem. Ind. Conf.*, Banff, AB, Canada, 1997, pp. 11–23, doi: 10.1109/PCICON.1997.648163.

[11] G. D. Gregory and L. K. Padden, "Application guidelines for instantaneous-trip circuit breakers in combination motor starters," *IEEE Trans. Ind. Appl.*, vol. 34, no. 4, pp. 697–704, Jul./Aug. 1998, doi: 10.1109/28.703960.

[12] *Recommended Practice for Motor Protection in Industrial and Commercial Power Systems*, IEEE Standard 3004.8-2016.

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- "Case Studies in Battery Risk Assessment," by David Rosewater and Curtis Ashton, and "Electric Vehicle Charging Safety—The State of Art, Best Practices and Regulatory Aspects," by Vesa Linja-aho
- "Modifying the DC Arc-Flash Max Power Formula to Give More Realistic Predictions of Maximum Arc-Flash Energy," by Curtis Ashton.

Keep studying and watching for further developments in our understanding of dc electrical hazards.

References

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[2] D. M. Rosewater, "Reducing risk when performing energized work on batteries," *IEEE Trans. Ind. Appl.*, vol. 60, no. 2, pp. 2732–2741, Mar./Apr. 2024, doi: 10.1109/TIA.2023.3332828.