

IEEE Power and Energy Society Entity Annual Report

2025

Entity:	Substations Committee
Website:	https://cmte.ieee.org/pes-substations
Chair:	Matt Bauer
Vice-Chair:	DJ Moreau
Secretary:	Eduardo Ramirez-Bettoni
Immediate Past Chair:	Joe Warner

1. Significant Accomplishments:

The Substations committee had a wonderful and productive year in 2025. The committee manages sixty-seven (67) standards.

As of the end of 2025, the Substations Committee had thirty (30) approved Project Authorization Requests (PARs) to create and maintain its standards among thirty one (31) Working Groups (WG).

The status of the PARs is:

- Completed – 6
- Draft development – 17
- Under balloting process – 7

The committee presented several technical sessions at IEEE PES GM, Annual Substations Committee 2025 meeting, and other shows:

- E0: IEEE PES Trending Tech, Resiliency Panel at IEEE GM 2025, Austin TX
- E0: Tutorial (IEEE 1127) at IEEE T&D Show 2026, Tutorial at Substations Spring Meeting 2026
- E0: Grid Resilience and Methods to Improve Considering Natural Impact (Wildfire, Tornado, Storms) tutorial in IEEE PES 2026 T&D Conference & Exposition
- E5: Tutorials held at SCE headquarters in Los Angeles, CA, 2025; and at IEEE GM 2025
- E7: present tutorial for 1402 at IEEE T&D Show 2026
- G8: Arc Flash Tutorial for Utilities, given by Eduardo Ramirez and Tom Short, IEEE GM 2025
- E0: CIGRE Paris Session Aug 2026, Poster Session of Substation Resilience

The committee provided several members with preparing and presenting on:

- IEEE Power and Energy Technology Assessment and Roadmap (TR 123) – IEEE GM 2025

The committee created a new SC T0 which is responsible of addressing new technologies, and EPM proposals. The processing of EPM proposals has greatly improved through the effort of T0.

2. Benefits to Industry and PES Members from the Committee Work:

The IEEE PES Substations Committee is the professional home for designers, engineers, field operations, safety professionals, testing laboratories, and manufacturers involved in the design, construction and operation of electrical substations used for generation, transmission, and distribution.

Moreover, committee activities include development of not only industry standards, but also educational material such as technical papers, white papers, presentations, tutorials, webinars, and panel discussions related to areas of interest. The main goal is to remain current in the industry hot topics and relevant state of the art.

The most notable activity of the Substations Committee is standard development and maintenance. This work includes the creation and revision of standards and guides through subcommittees and working groups. These standards are widely utilized and provide the most direct benefit to the industry, regulators, TSO, DSO, and PES Members.

Benefits to T&D industries include:

- Enhanced Reliability
- Technological Advancements
- Cost Efficiency
- System resiliency to growth, overload, extreme weather events, etc.
- Manufacturing standards
- Testing practices
- Electrical safety

Benefits to IEEE PES members:

- Professional Development including Ethics Training
- Networking Opportunities
- Recognition and Influence
- Access to Resources

The Substations Committee recognizes the impact of the participation of users in the development of its standards and continues to investigate ways to increasing electric utility participation. The Committee is looking into transforming the format of the meetings in terms of increasing impact on end users. In the New Orleans Spring meeting 2025, the Committee included user meetings, and discussion panels which had good utility attendance.

The Committee has put a focus on ensuring that the current and new standards cover applications up to 800kV *ac*, and +/- 1000kV *dc*. The Committee also focuses on the effect that extreme weather events cause on the power grid infrastructure, and the need to improve IEEE design standards (extreme wind, low temperatures, erosion, flooding, fires, ice accumulation). Large storms, extreme cold fronts, flooding are becoming more frequent and may reshape the way we envision the power grid resilience.



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With the maturing of the Digital Era, including the fast/large deployment of data centers, AI infrastructure, fast computing centers, and quantum computing, the committee is working actively to open a WG under T0 for addressing digital infrastructure which will develop new PARs for addressing new applications of AI in substation design and operation, and for integration of data centers and other fast computing infrastructure to the power system through substations. The committee recognized input from recent IEEE studies including but not limited to:

- PES-TR 131, Data Center Growth and Grid Readiness, Industry Technical Support Leadership Committee (ITSLC) Task Force on Data Center Growth and Grid Readiness
- T&D PES Transmission SC: TF on Data Center Interaction with T&D System
- IC25-004 Review of Industry Efforts and Standards of Grid Readiness for Data Center Deployment - Data Centers: Standards Needs Analysis and Recommendations Activity

The Substations Committee has six (6) technical subcommittees supporting forty-five (45) technical working groups (WG). The technical subcommittees and their scopes are as follows:

a. Electrical Substation Design Subcommittee (SCD0):

Responsible for treatment of matters pertaining to the electrical design and construction of transmission and distribution substations. These matters include air insulated station clearances and insulation levels, cable systems, air insulated bus design, seismic design, specification development and auxiliary systems.

b. Substation Civil Design (SCE0):

Responsible for treatment of matters relating to the civil and environmental design and construction of transmission and distribution substations. These matters include community acceptance, oil spill containment, fire protection, animal deterrents and physical and Electronic Security. WG E8 continues leading the Substation Physical Resilience topic in PES and beyond.

c. Substation Grounding and Lightning (SCG0):

Responsible for treatment of matters relating to grounding, lightning, arc flash, and minimum approach distances of transmission and distribution substations. These matters include safety, direct lightning stroke shielding, measuring earth resistivity, ground impedance and surface potentials of a grounding system, grounding safety, permanent connections, and arc flash. The SC plans on giving webinars, tutorials, and publish articles in PES magazine and other journals on the topic of arc flash safety.

d. FACTS & HVDC Stations (SCI0):

Responsible for treatment of all matters relating to design, construction, and operation of AC substations using HV power electronics as part of the electrical power system, including FACTS and HVDC converter stations at the Transmission and Distribution level. This includes the application of HV power semiconductor equipment and all other components insofar as they affect the design, construction, and operation of such substations. Interest in such components is limited to their effects on overall station parameters and does not include the detailed design of the equipment itself.

e. Gas Insulated Substations (SCK0):

Review, study and document design, application, installation, testing, operating and maintenance practices for gas insulated substations (GIS) and transmission lines (GIL). Identify the need for and sponsor the



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preparation of criteria, guides, tutorials, and standards as related to the gas insulated substations and transmission lines.

PES member involvement in working groups and subcommittees provides invaluable industry insight and knowledge sharing for members. Most design engineers design to standards because that is what the standard says. Attending these IEEE meetings not only provides more knowledge on why the standard is written, but more importantly why they design substations the way they do. It also provides a forum to discuss alternatives that may be acceptable.

f. Technology and Innovation (SCT0):

Responsible for the treatment of matters relating to new technologies and innovation (T&I) including suggesting ideas for papers, technical reports, and task forces. Additionally, this committee will serve as the home for project submissions through the Entity Proposal Management (EPM) Committee that fall under the scope of the Substation Committee but do not align with the scopes of existing subcommittees for projects to reach maturity.

3. Benefits to Volunteer Participants from the Committee Work:

Participants have benefited from their collaboration on technical problems with industry leaders and experts, discussing contemporary industry problems and concerns, and the satisfaction of creating standards and guides that are useful to the industry. Committee meetings have included presentations of experts in specific fields and debating of ideas and industry practices, including CIGRE member and IEC TAG member input. Substations Committee members have also benefited from their exposure to technical paper reviews and technical paper presentations.

Active participants also have opportunities to take on leadership roles and improve their leadership skills as well as mentoring skills working with teams with a variety of experience in technical and organizational activities.

Substations are considered strategic assets, and many components are now reaching the end of their original design life. Valuable information is exchanged on modern design approaches and explaining new technology, as well as the issues specific to new technology and suggested improvements for the electric power industry market; for example, Voltage-Source Converters (VSC) and alternative gases for insulation.

4. Recognition of Outstanding Performance:

The Committee is actively sponsoring members to become Fellow status. Currently these are the nominated members:

- Rich Keil
- Balint Nemeth

EPM proposals coordination: the committee wants to recognize the immense contributions of Brian Herrmann leading T0 and process EPM proposals on behalf of the Substations Committee.



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IEEE PES Award nominee:

- Brian Herrmann

During the Substations Spring meeting 2025 in New Orleans, the following recognitions were given to members for their outstanding contributions:

- Publishing of IEEE 525-2025: WG members
- Publishing of IEEE C37.122.3-2024: WG members
- Publishing of IEEE 837-2024: WG members
- Publishing of IEEE 693a-2024: WG members
- Prize Paper Award
- Working Group Recognition Award for Outstanding Standard or Guide: IEEE 605-2023
- Working Group Recognition Award for Outstanding Technical Report: PES-TR-107
- Distinguished Individual Service Award: Mr. Rich Keil
- Recognition Award for Outgoing Committee or Subcommittee Chairs: Eduardo Ramirez-Bettoni (G0)
- Technical Committee Recognition – Substations Fellows: Hermann Koch, Sakis Meliopoulos, Ram Adapa, Geza Joos
- Entergy Host Technical Committee recognition – Marnie Rousell, Alex Padilla, Juan Fernandez, Marilyn Ramirez, Logan Byrd, Gary Martin, Shawn Puleo

5. Coordination with Other Entities (PES Committees, CIGRE, standards, etc.):

The PES Substations Committee has determined that it is desirable to establish formal and direct liaisons with other IEEE Societies or groups, or other bodies, for the purpose of maintaining an efficient exchange of information on activities and related areas of mutual interest. This information exchange is accomplished through liaison representatives, appointed by the Substations Committee with the agreement and approval of the other group with which the liaison is to be established. The liaison representative will provide reports to the Substations Committee on activities of the other group, based on personal participation in these activities if possible. Depending on the preference of the other group, the liaison representative may also report to them on Substations Committee activities. Active Substation liaisons include:

- a. CIGRE B3, Substations
- b. IEC TC17, TC17C, High Voltage Switchgear
- c. IEEE Switchgear Committee
- d. NEMA (US) – Alternative Gases
- e. Publisher Wiley – Publication of IEEE GIS Handbook (K10)
- f. IEC TC78 – Live Working (G0, WGG8 - Arc Flash)

The Substation Committee is working on nine (9) co-standards shared with other IEEE PES Technical Committees which include Switchgear, Power Transformers, Power System Communications and Cybersecurity, Power Transformers, Power System Relaying and Control, and Transmission and Distribution.



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Substations Committee members are active participants and expert contributors at Cigre B3 WGs JWG B3/A3.67, A3.51, B3.68, and B3.69.

Upcoming USNC/Cigre and related events include:

- USNC CIGRE Annual Meeting at IEEE General Meeting, 2026
- CIGRE 2026 USNC Meeting at Paris Session
- Grid of the Future Symposium November 2026

Substations Committee members are active participants and expert TAG contributors at IEC TC17 (IEC 62271-Parts 1-5), SC 17A (IEC 62271 Parts 100-113, 300-319) and SC 17C (IEC 62271 parts 200-215, 304, 307, 312, 318). Next plenary meeting is Nov 14th-20th, in Hamburg.

6. Coordination and Involvement with Young Professionals:

The Substations Committee has a program to help support young professionals and experienced contributors with a scholarship program that will allow members from these groups to get financial assistance for meeting registration and hotel accommodations to attend working group meetings.

Due to the loss of our Membership Management System and the ongoing delays with implementing new system. Updated membership numbers and details are not accessible for 2022. The numbers below represent our 2021 numbers which should be a good representation of 2023.

Total Number of committee members	Number of Young Professionals (under 35 years of age) – Including committee & subcommittee	Officers from regions 8,9 and 10	Subcommittee officers from regions 8, 9 and 10	Subcommittee members from regions 8,9, and 10
569	Unknown	0	6	50

7. New Technologies of Interest to the Committee:

- Alternative insulating gases to SF₆
- Resiliency of GIS substations
- Digital infrastructure (data centers, quantum computing) and their integration to the power system
- Artificial intelligence (AI) applications for the power industry
- Digital substation design
- Vacuum circuit breaker for higher voltage ratings
- Voltage-Source Converter (VSC) STATCOM with Grid Forming (GFM) functionality providing instantaneous voltage support, fast short circuit current injection and system unbalance reduction.
- Grid Forming (GFM) STATCOMs with energy storage providing in addition fast frequency response.



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- Substation equipment manufacturing, design, testing and installation of systems rated up to 800 kV AC, and +/- 1000 kV DC (including GIS). Gain knowledge for AC systems operating up to 1200 kV AC.
- Performance testing of grounding grids, especially CIT current injection testing (for touch and step voltage, transfer voltage, GPR, etc.).
- Arc flash safety programs, incident energy estimation, work methods, protection technology/schemes, applications.
- New techniques to develop minimum approach distance (MAD) calculations for substations.
- Copper theft deterrent hardware, alarm/monitoring systems.
- Software that can address integration of grounding testing and grounding modelling.

8. Global Involvement

The committee has experts from several nations, and the contribution helps create standards that are relevant and current to the situation of several regions.

For example, K0 cooperates with GIS experts from Europe and Asia with member in working groups from France, Germany, Japan and Korea from industry. Young members are brought in by industry to let them learn and get involved in IEEE standardization processes.

Also, G0 cooperates with experts from the Americas, Europe, Africa, Asia, and Oceania with members in working groups from France, Germany, Japan, Canada, Ghana, Brazil, South Africa, Australia, from the industry. Young members are brought in by industry to let them learn and get involved in IEEE standardization processes.

9. Problems and Concerns:

Committee membership management, working group roster management, and participant communication has been a significant challenge in 2025 without a Membership Management System.

Electric utility attendance has improved but the committee is looking forward to finding ways to improve and increase the attendance to previous levels.

10. Significant Plans for the Next Period:

The Substations Committee will be hosting its next Annual meeting in Denver, CO in June 8th-12th, 2026 at the Hilton Denver City Center ([link](#)).

D0 plans for next period:

- D1: Developing draft for P1427
- D2: Drafting PAR for 525
- D3: Developing draft for P605
- D4: Revision underway for 693



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- D6: Working on PAR extension for 1527, and draft development
- D8: Developing draft for PAR for 1267
- D9: Ballot recirculation for 1818

E0 plans for next period:

- Develop tutorials & webinars for newly published guides
- Present at IEEE PES GM 2026 panel, July 2026, Montreal, Canada
- Present tutorial for IEEE 1127 at Substations Spring Meeting 2026, Denver, CO
- E2: Develop new PAR for 980, work on webinar
- E3: finish publishing 979-2026; work on tutorial and webinar
- E5: Develop new PAR for 1264
- E7: present IEEE 1402 tutorial at IEEE T&D Show 2026, develop PAR for 1402
- E8: finalize draft for P3443

G0 plans for next period:

- Appoint new officers in WG4, WG5, WG9 – looking for candidates/nominees
- G4: P1246 ballot re-circulation, send P1268 to ballot
- G5: P998 BRG is finished with comment review, submit std to IEEE SA for publishing
- G6: WG6 is working on developing a tutorial for the recently published edition of IEEE 81-2025
- G7: P80, finalize draft, approve by SC and send to ballot in 2026
- G8: produce a mature draft in 2026 and possibly send to ballot by beginning of 2027
- G9: IEEE 837 was published and WG is working on an IEEE certification for testing
- Recognition for Curtis Stidham as past G7 Secretary.

K0 plans for next period:

- K1: develop PAR for C37.122
- K2: develop tutorial for C37.122.2 for T&D Show
- K3: submit to publish C37.122.3
- K4: develop mature draft for PC37.122.4
- K6: continue developing GIS/GIL tutorial
- K8: develop mature draft for PC37.122.6
- K10: discuss changes for GIS/GIL handbook. Discuss new book for non-experienced GIS users.
- K11: ballot for PC37.122.1
- C37.20.9 (Joint): PAR under development
- K18: present final draft to REVCOM for PC37.122.8
- K19: present final draft to REVCOM for PC37.122.10 (Joint)

I0 plans for next period:

- I1: PC37.431.40, develop final draft
- I2: P1534, submitted to ballot in 2025
- I3: PC37.431.10, develop final draft
- I7: IEEE 1240, PAR development
- I9: PC37.431.20, submitted to ballot in 2025
- I11: PC37.430.10

T0 plans for next period:

- T1: NEW – Digital Infrastructure: Data Centers, AI, etc. - Developing NEW PAR
- T2: NEW – Substation Planning Guide- Developing NEW PAR
- T3: NEW – 765kV Substation Planning Guide- Developing NEW PAR
- Review and coordinate upcoming EPM proposals / entity PAR for 2026

Submitted by: Eduardo Ramirez-Bettoni, Secretary

Date: 1/31/2026