

IEEE Power and Energy Society Entity Annual Report

2022

Entity: Transmission and Distribution Committee

Website: <https://cmte.ieee.org/pes-td/>

Chair: Surya Santoso

Vice-Chair: Eriks Surmanis

Secretary: Julio Romero Agüero

Immediate Past Chair: Gary Chang

1. Significant Accomplishments:

The Transmission and Distribution Committee (henceforth, the T&D Committee) has been operating under the same Organization and Procedures (O&P) Manual for eight years since 2014. The T&D Committee revised and updated the 2014 O&P Manual in 2021 and 2022. The revision includes removing subcommittees that had been phased out or joined other committees, including the new Transmission Subcommittee as a responsible subcommittee and Power Quality Standards Coordinating Subcommittee 22 as a non-responsible subcommittee. Other changes include improving the clarity of responsibilities, appointing Standards Committee Representatives (SCR) for Entity Projects, and updating options for meeting modality (e.g., remote/in-person/hybrid). Specific procedures and requirements related to the operation of the T&D Committee working groups are defined in the upcoming Policy and Procedures for Working Groups. The revised and updated T&D Committee O&P Manual was approved by the Technical Council of the IEEE PES in May 2022 and published on the above T&D Committee website.

The T&D Committee is comprised of 7 responsible subcommittees and 1 non-responsible subcommittee with a total of 80 WGs/TFs. During 2022, the T&D Committee approved 23 conference papers for publication and 18 panel sessions in IEEE PES GM 2022. The majority of panel sessions were industry-oriented, with chairs or panelists from the industry and utility sectors.

One of the committee members was the Technical Co-chair of the 2022 T&D Conference. They will be the Technical Program Chair of the 2024 T&D Conference. They will be developing the technical program for the conference, along with overseeing the selection of the panels, poster papers, and Smart Cities and Innovation Stages presentations. Another committee member was selected to be the Technical Co-chair for the conference and Technical Program Chair of the 2026 T&D Conference.

The T&D Committee, through its officers and members, contributed to the Technical Council and PES in many ways, such as participation in the PES Fellow Nominations Committee, R9 T&D Satellite Committee, PES Climate Change Inventory, the development of whitepapers for ITSLC, and review and trial of MemberPlanet platform, and others.

The T&D Committee is the Standards Committee for 71 standards development projects and 65 active standards. Additionally, the T&D Committee is a Co-Standards Committee-sponsor committee of nine standards development projects: P1547, P1547.10, P1547.2, P1613, P1793, P2426, P2800.2, P2852, and P2973. Four of those Co-Standards projects are within PES, but three others are led by IEEE Standards



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Committee 21, one by the IEEE SA Entity Collaborative Activities Governance (CAG) Board, and one by the Systems, Man, and Cybernetics Society.

As part of Entity Proposal Management (EPM), the T&D Committee reviewed 18 proposals. Of these 18 proposals, the T&D Committee stated that 7 of them were within its scope. The T&D Committee was granted oversight for 4 of these proposals, and 2 of the proposals are still awaiting the final decision from the EPM Committee.

Despite its modest size, the T&D Committee manages and oversees a large swath of PES projects, specifically 13% and 18% of all active PES standards and PARs, respectively. Below is a summary of standards that were and are under revision, waiting for approval, or approved, overseen by each Subcommittee under the T&D Committee:

CAPACITOR SUBCOMMITTEE

- IEEE 824 - IEEE Standard for Series Capacitor Banks in Power Systems. The Ballot group received a 90% approval rate and has been working to address comments. The P824 is to expire on December 31, 2024.
- IEEE 1726 - IEEE Guide for the Functional Specification of Fixed-Series Capacitor Banks for Transmission System Applications. P1726 was approved in December 2022. The standard update and revision are set to commence in 2023, immediately after P824 comments are addressed.
- IEEE 18 - Standard for Shunt Power Capacitors. P18 expired in December 2022 and thus extended to December 2023. The extension allows the WG to address comments received from the ballot group.
- IEEE 1036 - IEEE Guide for the Application of Shunt Power Capacitors. The WG has developed a draft with the expected submission date to the IEEE SA for the initial ballot between December 2023 and January 2024.
- IEEE Std 1531-2020, IEEE Guide for the Application and Specification of Harmonic Filters. The Guide was officially published on January 26, 2021.

DISTRIBUTION SUBCOMMITTEE

The Distribution SC had three individual standards (P1366, P1782, and P1885) and two entity standards (P2748 and P2749) approved by IEEE-SA in 2022. It also had two additional ones (P2845 and P3102) approved by the subcommittee to go to ballot. There was also one Technical Report (DES-PES-TR98) that was approved to go to the PES Resource Center. The option of virtual meetings at JTCM in January 2022 maintained participation levels near 2021's increase. However, when the meeting moved to in-person for PES GM, participation was reduced. A hybrid approach to meetings going forward should be evaluated. Below is an update on each of our PARs:

- IEEE 2856 - Guide for the Definition of Resiliency and Measuring the Resiliency of the Electrical Distribution System. Guide is under development by Working Group.
- IEEE 1695 – Guide to Understanding, Diagnosing and Mitigating Stray Contact Voltage. PAR active. Still in progress. Working Group anticipates going to ballot in 2023.
- IEEE 1656 - Guide for Testing the Electrical, Mechanical, and Durability Performance of Wildlife Protective Devices on Overhead Power Distribution Systems Rated up to 38 kV. PAR is active and has gone thru MEC review. Currently addressing MEC comments
- IEEE 3102 - Standard for Conservation Voltage Reduction (CVR) Data Collection and Management Procedures PAR recently approved. Ballot pool formed, waiting to start the ballot.
- IEEE 1854 - Guide for Smart Distribution Applications PAR active. Still in progress. Working Group anticipates going to ballot in 2023. Working on draft with co-sponsoring committees.

- IEEE 2845 - Draft Trial-Use Standard for Testing and Evaluating the Dielectric Performance of Celebratory Balloons in Contact with Overhead Power Distribution Lines Rated up to 38kV System Voltage. PAR is active and Ballot pool formed, waiting to start the ballot.
- IEEE 2748 - Recommended Practice for Fault Diagnosis and Protection in Smart Distribution System. Entity PAR Active
- IEEE 2749 - Recommended Practice for Risk Identification and Evaluation of Smart Power Distribution System. Guide is currently in ballot.
- IEEE 1782 - Guide for Collecting, Categorizing and Utilization of Information Related to Electric Power Distribution Interruption Events. Guide approved and published in 2022.
- IEEE 1366 - Guide for Electric Power Distribution Reliability Indices. Guide approved and published in 2022.
- IEEE 1885 - Guide for Assessing, Measuring and Verifying Volt-Var Control Optimization on Distribution Systems. Guide approved and published in 2022.
- IEEE 1806 - IEEE Guide for Reliability-Based Placement of Overhead and Underground Switching and Overcurrent Protection Equipment up to and Including 38 kV. Guide approved and published in 2021.

ENGINEERING IN THE SAFETY, MAINTENANCE AND OPERATION OF LINES (ESMOL) SUBCOMMITTEE

In 2022, ESMOL published our flagship document, IEEE 516 – Guide for Maintenance Methods on Energized Power Lines. ESMOL presented a panel session on wildfire mitigation at the 2022 PES General Meeting and is planning to lead additional panel sessions at future meetings. Below is an update on each of our PARs:

- IEEE 516 - Guide for Maintenance Methods on Energized Power Lines, Corrigendum 1.1. The corrigendum correcting two typographical errors will be completed in 2023.
- IEEE 957 - IEEE Guide for Cleaning Insulators. The PAR has been issued, and the document will be balloted in 2023.
- IEEE 1048b - Guide for Protective Grounding of Power Lines, Amendment: Differentiating the Fabric Carrier Mat and the Rigid Carrier Mat. The revision to the guide is in progress and will be finished in 2023.
- IEEE 1067 - Guide for In-Service Use, Care, Maintenance, and Testing of Conductive Clothing for Use on Voltages Up to 765 kV ac and +/- 750 kV dc. The PAR has been issued, and work continues on the revision, with the expected date of submission of the draft for an initial ballot in 2023.
- IEEE 1070 - Guide for the Design and Testing of Transmission Modular Restoration Structure Components. A PAR was requested in 2022 and is currently being revised after receiving comments from the committee.
- IEEE 1307 - Standard for Fall Protection for Utility Work. ESMOL has initiated a task force to examine revisions for the next update cycle.
- IEEE 1882 - Guide for Establishing, Benchmarking and Maintaining a Work Program for Energized Transmission Lines will be balloted in 2023.
- ESMOL is currently drafting several papers, including the following: Helicopter Work and Qualifications, Live Working Insulator Testing, and Transmission and Distribution Minimum Approach Distance.



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HVDC & FACTS SUBCOMMITTEE

The Subcommittee sees strong interest in its activities and publications due to the rapid ongoing energy transition. It is also committed to promoting diversity, recognizing outstanding contributors, disseminating state-of-the-art knowledge through panel sessions, Tutorials, and webinars in PESGM and T&D Conferences, and publishing PES Reports. Recently, we have seen a strong interest in new Standards related to this subcommittee. We are currently setting up a standards group to respond to that increase. The Subcommittee comprises five working groups. The IEEE P2745 Unified Power Flow Controller (UPFC) Working Group also reports to this Subcommittee. Our significant accomplishments in 2022 are as follows:

- **Introducing Diversity**
The Subcommittee continues its efforts to have diverse leadership. Robyn Koropatnick, Principal Stantec, Winnipeg, Canada, has been serving as Subcommittee Secretary in 2021.
- **Award Nominations**
The Subcommittee strongly believes that several individuals working groups are making outstanding contributions, which need to be recognized. The Subcommittee made special efforts to nominate worthy individuals for all three T&D Committee awards - Best Paper, Outstanding Guide, Outstanding Report; and one PES level award. Below are the awards:
 - The Subcommittee WG “Studies for Planning of HVDC” Technical Report “PES TR-86 Studies for Planning HVDC”, finalized in February 2021, received the T&D committee Award 2022.
 - T&D best paper award 2022 nominated by the subcommittee: Julian Freytes, Samy Akkari, Pierre Rault, Mohamed Moez Belhaouane, François Gruson, Frédéric Colas, and Xavier Guillaud, “Dynamic Analysis of MMC-Based MTDC Grids: Use of MMC Energy to Improve Voltage Behavior,” IEEE Transactions on Power Delivery, February 2019
 - Subcommittee active member Mojtaba Mohades received the “Custom Power Award”
- Furthermore, four panel sessions have been proposed for the IEEE PESGM 2023, and additional panels for the IEEE PES T&D Conference. Interest in participation in Supersessions has also been expressed.
- A webinar on Studies for planning of HVDC was held, which gained significant attendance
- Two new Task Forces (TF) were started in 2021, one of which conducted a widely attended international webinar.
 - TF on Multi-scale Modeling and Simulations of HVDC and FACTS
 - TF on Frequency-domain modeling and dynamic analysis of HVDC and FACTS
- Tutorial on VSC – HVDC was delivered during the 2022 IEEE PES GM.
- A new proposal for a tutorial regarding “Studies for Planning of HVDC” was submitted for GM 2023
- Plans for next year:
 - Participation in a supersession on HVDC & FACTS.
 - Recruiting new and younger members active in the committee.
 - Having multiple, short online meetings to better follow up on the progress and action points.
 - Formalize/activate collaboration with “HVDC Subcommittee of IEEE Transformers Subcommittee.”
 - Initiate standards follow-up from the subcommittee.

- Coordination: a shift to a 2-year cycle for the leadership is introduced. Prof. Rajiv Varma was chair 2021-2022, vice-chair Dirk Van Hertem will transition to chair while Robyn Koropatnick to vice-chair.

OVERHEAD LINES SUBCOMMITTEE

In 2022, the OHL SC established three new entity working groups for new standards and opened PARs for three individual standards revisions. All 10 of our standing working groups and their approximately 20 task forces met twice at the JTCM (hybrid) in January and PES General Meeting in July to maintain standards progress and education. We hosted a panel session that was accepted for the 2022 IEEE T&D Conference & Expo on the recent FERC Order 881 regarding transmission line ratings with over 80 attendees and scheduled a follow-up panel session for the 2023 PES General Meeting.

Below is an update on each of our PARs:

- IEEE 2819 - Recommended Practice for Measuring Method of Electromagnetic Environment for the Corridor of High-voltage Overhead Power Transmission Lines in Parallel Mixed with Alternating Current and Direct Current
 - Published June 10, 2022
- IEEE 2870 - Guide for Grip Test Method for Fittings of High-Temperature, Low-Sag Overhead Conductor Under Tension and Electric Current Co-Effect
 - Published March 31, 2022
- IEEE 2871 - Standard for Wedge-Shaped Groove Clamps
 - Published May 27, 2022
- Projects in ballot resolution or further, plan to publish in 2023:
 - IEEE P1308 - Recommended Practice for Instrumentation: Specifications for Magnetic Flux Density and Electric Field Strength Meters - 10 Hz to 3 kHz (Ballot complete)
 - IEEE P2683 - Guide to Strength Loss in Tubular Steel Poles (Revcom approved)
- Projects nearing completion that plan to go to ballot in 2023:
 - IEEE P563 - Guide on Conductor Self-Damping Measurements
 - IEEE P664 - Guide for Laboratory Measurement of the Power Dissipation Characteristics of Aeolian Vibration Dampers for Single Conductors
 - IEEE P738 - Standard for Calculating the Current-Temperature Relationship of Bare Overhead Conductors (Ballot pool open)
 - IEEE P751 - Guide for Wood Structures Used for Overhead Electric Transmission Lines
 - IEEE P987 - Guide for Application of Composite Insulators for Overhead Electric Power Lines
 - IEEE P1227 - Guide for the Measurement of DC Electric-Field Strength and Ion Related Quantities
 - IEEE P1410 - Guide for Improving the Lightning Performance of Electric Power Overhead Distribution Lines
 - IEEE P2797 - Guide for Forecast and Early Warning of Icing on Overhead Transmission Lines in Micro-topographic Areas
 - IEEE P2954 - Recommended Practice for Overhead Transmission Line Design (Ballot pool open)
- Projects in progress with plans to complete in 2024:
 - IEEE P691 - Guide for Transmission Structure Foundation Design and Testing
 - IEEE P1218 - Trial-Use Guide for Maintenance of Wood Transmission and Distribution Line Structures

- IEEE P1243 - Guide for Improving the Lightning Performance of Transmission Lines
- IEEE P1808 - Guide for Collecting and Managing Transmission Line Inspection and Maintenance Data
- IEEE P2833 - Guide for Overhead Transmission Lines with Composite-Insulated-Crossarm Supports
- IEEE PC135.100 - Standard for Line Hardware on Overhead Line Construction
- IEEE PC135.90 - Standard for Pole Line Hardware for Overhead Line Construction
- Projects in progress with plans to complete in 2026 (or earlier):
 - IEEE P524 - Guide to the Installation of TL Conductors
 - IEEE P977 - Guide to Installation of Foundations
 - IEEE P1724 - Guide for the Preparation of a T-Line Design Criteria Document
 - IEEE P1829 - Guide for Conducting Corona Tests on Hardware for OHL
 - IEEE P2942 - Guide for In-Service Application, Care, Maintenance, and Testing of Insulating Flexible Slings for Live Working
 - IEEE P3132 - Guide for Spacers and Spacer-Dampers on Bundled Conductors
 - IEEE PC135.80 - Standard for Fasteners for Overhead Line Construction

POWER QUALITY SUBCOMMITTEE

Seven power quality working groups contributed three panel sessions which were well attended.

1. Power Quality Issues of Grid Modernization Activities
2. Modeling and Simulation of Unintentional Emissions in the Frequency Range 2-150 kHz
3. IEEE 1250 Guide for Identifying and Improving Voltage Quality in Power Systems (Past, Present and Future)

Panel sessions proposed for the 2023 PES GM are:

1. IEEE 519-2022: Update on recent changes
2. Harmonics Modeling and Simulation of Large Wind and Solar Power Plants

Below is an update on each of our PARs:

- IEEE 1159.3 - Recommended Practice for Power Quality Data Interchange Format (PQDIF).
 - Active PAR, in draft.
- IEEE 1159 - Recommended Practice for Monitoring Electric Power Quality.
 - Active PAR, in draft.
- IEEE 1409 - Guide Technology Methods for Power Quality Improvement in Electric Power Systems.
 - Active PAR, in draft. New chair: Theo Laughner.
- IEEE 1453 - Standard for Measurement and Limits of Voltage Fluctuations and Associated Light Flicker on AC Power Systems.
 - Active PAR, waiting for publication. New chair: Vong Chan.
- IEEE 1564 - Guide for Voltage Sag Indices.
 - Active PAR, in draft.
- IEEE 3139 - Guide for Power Quality Data Analytics. Expected date of draft submission for initial ballot is November 2024.
- IEEE 2844 - Recommended Practice for Limiting Voltage Imbalance in Electric Power Systems
 - Active PAR, in draft.
- IEEE 519 - Standard for Harmonic Control in Electric Power Systems. Expected date of draft submission for PAR is prior to the 2023 PES GM.

- IEEE 1250 – Voltage Quality Working Group. Expected date of draft submission for PAR is prior to the 2023 PES GM.

TRANSMISSION SUBCOMMITTEE

The Transmission Subcommittee held its first in-person meeting during the most recent JTCM. The Subcommittee has 4 working groups staffed with Chairs. They are

1. Reliability Impacts of Inverter-Based Resources WG (Chris Postma)
2. Generation and Energy Storage Integration WG (Rahul Anilkumar)
3. Transmission Switching WG (Fengyu Wang)
4. Transmission Voltage Optimization WG (Alberto Del Rosso)

The Switching WG will change its name to Grid Enhancing Technologies to better reflect the scope of the WG. The Transmission Subcommittee has three planned 2023 GM panels.

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

The scope of the T&D Committee is the treatment of all matters related to the design, theoretical and experimental performance, installation, and service operation of parts of electric power systems that serve to transmit electric energy between the generating sources and substations or customer points of common coupling through AC or DC lines. In 2022, the Committee provided benefits to the industry by:

- Maintaining, updating, developing, and managing standards and guides on capacitors, distribution systems, lightning, HVDC/FACTS, power quality, and overhead lines, including their safety, operation, and maintenance,
- Disseminating technical know-how and recommended practices through panel sessions, paper publications, standards, and tutorials, and
- Providing the industry with a venue for participating in cutting-edge research and best practices dialogs and the standards-making process.

3. Benefits to Volunteer Participants from the Committee Work:

The IEEE PES Transmission & Distribution Committee provides benefits to its volunteer participants in the following ways:

- Offering participants an opportunity to work with acknowledged leaders in shaping the T&D industry and informing them on T&D issues.
- Affording industry leadership roles and mentoring volunteer participants
- Providing a forum for networking with peers from the T&D industry

4. Recognition of Outstanding Performance:

The following individuals with direct, indirect, past, and current affiliations with T&D Committee were elevated to IEEE Fellow and won the PES Society Level awards this past year:

IEEE Fellows for Class of 2023

- Marta Molinas - for contributions to modeling and stability of power electronics
- Xiongfei Wang - for contributions to power-electronic-based power systems

PES Society Level Award

- Mojtaba Mohaddes- 2022 IEEE PES Nari Hingorani Custom Power Award



- Mark F. McGranaghan – 2022 IEEE PES Award for Excellence in Power Distribution Engineering

PES Technical Committee Award The T&D Committee submitted nominations for the following recognition:

- IEEE PES Prize Paper Award: M. Abedrabbo, W. Leterme and D. Van Hertem, "Systematic Approach to HVDC Circuit Breaker Sizing," in IEEE Transactions on Power Delivery, vol. 35, no. 1, pp. 288-300, Feb. 2020, doi: 10.1109/TPWRD.2019.2922253.
- IEEE PES Technical Committee WG Recognition Award for Outstanding Technical Report: PES-TR97, Electric Field Modeling Practices and Sensitivity Analysis for Transmission Line Composite Insulators, by Insulator Performance and Applications Working Group of the Overhead Lines Subcommittee.

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

- PES Energy Internet Coordinating Committee
- PES Entity Proposal Management Committee
- PES Intelligent Grid and Emerging Technologies Coordinating Committee
- PES Marine Systems Coordinating Committee
- PES Renewable Systems Integration Coordinating Committee
- Liaisons with numerous IEC, CIRED and CIGRE committees
- Liaisons with numerous NESC and ANSI committees.
- Liaisons with US National Committee for CIRED via IEEE PES Distribution Subcommittee and IEEE PES Power Quality Subcommittee
- Liaison with NEMA via Capacitor Subcommittee
- Liaison with Power and Energy Magazine
- Liaison with Industry Technical Leadership Committee
- Category A Liaison between the PQ Standards Coordinating Subcommittee and IEC Subcommittee 77A

6. New Technologies of Interest to the Committee:

Technologies of interest include emerging and mature technologies enhancing the performance of transmission systems, overhead line maintenance, inspection, and safety, smart distribution devices, and power quality instrumentations, algorithms, and analytics.

7. Global Involvement

PES is looking to increase involvement with members from Regions 8, 9 and 10 (Africa, Europe, Middle East, Latin America, Asia and Pacific). The T&D Committee participates in the initial discussion for establishing IEEE T&D Committee Region 9 Satellite Committee.

Total Number of committee members	Officers from regions 8,9 and 10	Subcommittee officers from regions 8, 9 and 10	Subcommittee members from regions 8,9, and 10
1300-1400	1	0	30



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8. Problems and Concerns:

The unexpected shutdown of the 123signup platform causes issues with membership registration, attendance tracking, and other issues. The ongoing pandemic evokes challenges and opportunities. In-person interaction and networking were adversely impacted, while virtual attendance gained acceptance. A hybrid approach to meetings in the future should be evaluated. The availability of conferencing and audio/visual technologies and robust WiFi is necessary for successful hybrid meetings.

9. Significant Plans for the Next Period:

The T&D Committee continues overseeing, maintaining, and developing standards within its scope. The Committee is committed to supporting the Technical Council's Entity Proposal Management process.

The T&D Committee, through its officers, plans to develop information sessions to encourage fellow nominations of its members.

PES is currently working on a mentorship program for Young Professionals since this is the fastest-growing membership segment. Members of the T&D Committee are already participating in this initiative. The T&D Committee will help identify potential additional mentors for this program.

Submitted by: Surya Santoso

Date: January 29, 2023