

IEEE Power and Energy Society Entity Annual Report

2025

Entity: CSG EHV CHN
Website: <https://r10.ieee.org/cc-pes/dcps/>
Chair: Qian Zhu
Vice-Chair: Xiaoping Zhang
Secretary: Yining Zhang
Liaisons: Ying Xue
Immediate Past Chair: Xiangqiang Liu

1. Significant Accomplishments:

From November 29 to 30, 2025, the IEEE PES Satellite Technical Committee - DC Power System and North China Electric Power University (NCEPU) successfully co-hosted the 2025 IEEE International Conference on DC Technologies and Systems (DCTS 2025). The annual meeting of the IEEE PES DC Power System Technical Committee was held concurrently.

During the session, delegates reviewed the annual progress reports presented by the Technical Committee and its six specialized subcommittees. These reports covered a wide range of dimensions, including technical research, project milestones, the commercialization of research results, and industry applications. Collectively, these updates underscored the committee's pivotal role in spearheading technological innovation and industrial growth within the DC power systems sector.

The conference also deliberated and voted on leadership transitions within the Technical Committee and its subcommittees. Following extensive discussion and a democratic voting process, the Committee appointed Mr. Zhu Qian, Deputy General Manager of China Southern Power Grid (CSG) EHV Power Transmission Company, as the Chair of the IEEE PES Satellite Technical Committee - DC Power System (China). Additionally, new members were inducted and existing roles adjusted to further optimize the organizational framework, injecting fresh vitality into the Committee's long-term development.

The successful conclusion of this annual meeting not only defines the strategic roadmap for the Committee's future but also establishes a more expansive platform for academic exchange and

collaboration in the field of DC power system. The election of the new Chair and key leadership members marks the beginning of a new chapter. The Committee is poised to drive the evolution of DC power technology and contribute more "Chinese Wisdom and Solutions" to the global energy transition.

1) IEEE PES Satellite Technical Committee - DC Power System DC Transmission Control and Protection Sub-Committee

①Inaugural offline work meeting and academic exchange. On October 19, 2024, the subcommittee convened the first plenary session of its third term in person, successfully completing the committee's leadership transition.

②Routine operations conducted via the official website. Daily tasks, including information disclosure, knowledge sharing, and member record-keeping, were carried out through the subcommittee's website. This included the public notification of awards for outstanding members and excellent papers. Furthermore, 10 system research reports were finalized based on the Xingan DC Control and Protection Retrofit Project and the Xiang-Qian Back-to-Back DC Construction Project. Since 2025, 12 new executive directors and council members have been appointed, with their registration and filing completed on the official website.

2) IEEE PES Satellite Technical Committee - DC Power System DC Distribution Network Technical Sub-Committee

①In 2025, the subcommittee participated in the DC Power System Technical Seminar hosted by the IEEE PES DC Power System Technical Committee.

3) IEEE PES Satellite Technical Committee - DC Power System DC Transmission and Transformation Equipment Technical Sub-Committee

①Technical Breakthroughs: The subcommittee pioneered the world's first oil-filled submarine cable DC current-carrying test technology, which allowed for the precise verification of operating boundaries and ensured the successful, one-time commissioning of the R5 submarine cable. Additionally, the subcommittee innovatively applied a partial discharge (PD) localization technology—integrating pulse current, ultrasonic arrays, and multi-channel high-frequency CT—to achieve the precise diagnosis of fault locations within converter transformers.

②Standards Leadership: The subcommittee successfully advanced a DC GIL standard proposal through its preliminary review at the IECTC17 meeting. Leveraging project outcomes, the subcommittee also formulated the IEC White Paper proposal titled "Fire Protection and Extinguishing Technologies for Renewable Energy Generation and Storage Facilities Towards a Low-Carbon Future," resulting in the approved establishment of the IEC SWG 25 working group under the Social and Technical Trends (STTG) framework.

4) IEEE PES Satellite Technical Committee - DC Power System DC Transmission and Distribution System Simulation Technical Sub-Committee

① The subcommittee successfully organized its annual meetings and conducted in-depth technical exchanges with international peers. The subcommittee vice chair engaged in high-level technical dialogues with Saifur Rahman, the former President of IEEE.

② The subcommittee published multiple high-level academic papers, effectively promoting the dissemination of and cooperation in DC transmission simulation technology both domestically and internationally. The subcommittee vice chairs delivered an invited report at the "2nd New Energy and Energy Storage Engineering Forum" and participated in the IEEE International Conference on Artificial Intelligence Applications in Electrical Engineering.

5) IEEE PES Satellite Technical Committee - DC Power System DC System Planning and Design Technical Sub-Committee

① Subcommittee work: In 2025, the subcommittee organized its annual meeting and approved resolutions regarding personnel changes within the committee. The subcommittee conducted in-depth discussions on the latest research findings in emerging technologies, specifically focusing on converter valve hall design and DC system design.

② Research Reports and Technical Standards: The subcommittee finalized the documents titled "Design of Multi-terminal and Hybrid DC Systems" and "Design of Offshore Wind DC Transmission Systems." Simultaneously, the Subcommittee is actively drafting research reports on "Converter Station Valve Hall Design" and "Research on New Grounding Electrode Technologies." In terms of standardization, the subcommittee oversaw the official release of the national standard GB/T 311.14-2024 Insulation co-ordination – Part 14: AC filters for HVDC systems and insulation co-ordination. Furthermore, the subcommittee completed the Committee Draft (CD), along with the solicitation of comments and voting procedures, for the international standard IEC 60071-14: Application guidelines for AC/DC filters.

6) IEEE PES Satellite Technical Committee - DC Power System Low Voltage DC Technical Sub-Committee

① In April 2025, Subcommittee Vice Chair Zhao Zhigang delivered a keynote report titled "PEDF Empowering Rural Vitalization: Energy Autonomy and Industry-to-Countryside Integration" at the inaugural Rural Energy Industry Development Conference.

② In June 2025, Subcommittee Vice Chair Hao Bin presided over the fifth working meeting for the revision of the "Design Standard for DC Power Distribution in Civil Buildings" held at Beijing Jiaotong University.

③In August 2025, Subcommittee Deputy Secretary-General Yang Chao was invited to participate in the "China-Africa Clean Energy, Renewable Energy, and Inclusive Finance Workshop," where he shared a technical report on "PEDF Microgrid Technology".

④In September 2025, Committee Member Sun Kaiqi presented an invited report titled "Research on Operation Modes and Control of Embedded DC Interconnection Systems in Urban Power Grids" at the Mount Tai New Energy Storage Development Conference.

⑤In April 2025, Committee Member Yuan Jinrong delivered a keynote speech titled "PEDF Assisting Urban Renewal: Zero-Carbon Living and Quality Improvement" at the Shanghai Urban Campus Low-Carbon Transformation Forum.

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

IEEE PES STC-DCPS, as a specialized organization, is responsible for aggregating information on the DC power and energy industry, promoting academic exchange, and expanding the knowledge and influence of its members. Through a series of initiatives, the Committee enables information sharing within the industry and provides a platform for professionals in the field of DC power and energy to exchange and learn. On this basis, the Commission has also worked to expand its influence and become a major force in the DC power and energy industry. The committee follows industry trends and actively aggregates the latest information in the field of DC power and energy. This includes information on new technologies, new products, standards and policies. In this way, the committee provides members with timely and accurate industry information to help them understand market trends and grasp the direction of industry development. In addition, the Commission also publishes regular industry reports to analyze the current situation and future development trends of the DC power market to provide references for corporate decision-making.

Moreover, the Committee is committed to promoting academic exchange and knowledge sharing among its members. In order to achieve this goal, the Committee organizes a series of academic activities, such as seminars, lectures, training and conferences. These events invite industry experts to share their experiences and research findings, providing members with opportunities to learn, network and collaborate. By actively participating in these activities, members have expanded their knowledge and improved their professionalism.

Through a series of initiatives, the Commission provides a platform for professionals in the field of DC power and energy to exchange learning and promote the development of the industry. In the future, the Committee will continue to perform its duties and make greater contributions to the prosperity of the DC power and energy industry.

3. Benefits to Volunteer Participants from the Committee Work:

After participating in various activities, volunteers can gain profound insights into the latest developments and trends in the DC power industry. They engage directly with industry experts and leaders, learning from their extensive experience and deepening their knowledge, thereby broadening their perspectives. These experiences undoubtedly enhance their understanding of the future of the DC power industry. Volunteers also acquire a comprehensive understanding of its organizational structure and operations, mastering effective contribution within a large professional setting and enhancing their capabilities. This invaluable experience significantly bolsters their future career development.

Through committee involvement, volunteers also have the opportunity to transition into members of the PES. This acknowledgment not only validates their professional acumen but also provides them with an expansive platform to delve into research and practical applications across broader domains of electrical engineering. It nurtures their ability to autonomously conduct scholarly presentations. Engaging in academic research tasks necessitates volunteers to independently conduct research, employ critical thinking, draft reports, and present findings at academic conferences. These experiences not only refine their academic prowess but also elevate their communication and presentation skills, rendering them more competitive in their prospective academic and professional pursuits.

4. Recognition of Outstanding Performance:

IEEE PES STC - DCPS, esteemed authorities in the industry, are committed to advancing academic research and industry standards. To foster greater participation from scholars and researchers in high-quality academic endeavors, each sub-committee undertakes initiatives to acknowledge and incorporate outstanding papers and standard proposals. Ensuring fairness and authoritative evaluation, distinguished experts and scholars from the industry are invited to comprise the review panel. Submissions undergo comprehensive assessment based on criteria including innovation, practicality, and academic merit. This meticulous process culminates in the annual publication of a curated collection of papers and the accolade of outstanding members of the year.

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

- 1) Liaise closely with CIGRE NGN Youth Expert Committee (China) to plan follow-up joint activities.
- 2) The IEEE DC standard developed by the DC Transmission Control and Protection Sub-Committee was officially released (IEEE Guide for Technical Requirements for Hybrid High-Voltage Direct Current Transmission Protection and Control Equipment).
- 3) DC System Planning and Design Technical Sub-Committee organized members to submit papers and attend the IEEE International Conference on DC Technology and Systems (IEEE DCTS 2025).

6. Coordination and Involvement with Young Professionals:

- 1) Actively carry out the expansion of the Sub-Committee to recruit new members, actively attract young scholars to join the Sub-Committee, add members and directors, constantly promote the development of the Sub-Committee, and contribute young people to the development of DC technology.
- 2) Inviting young technical experts to give keynote speeches, providing opportunities for technical demonstrations and exchange and discussion on expert pulse diagnosis.

7. New Technologies of Interest to the Committee:

1) IEEE PES Satellite Technical Committee - DC Power System DC Transmission Control and Protection Sub-Committee

The Sub-Committee's working groups focus on the following new technology research directions:

①HVDC Control Strategy and Technology Research working Group: Research on key technologies and engineering applications of flexible DC interconnection power control in large power grids; Research and field test of low frequency transmission technology.

②Working Group on the application of new theories and technologies in HVDC projects: Adaptive methods for transmission line protection and diagnosis considering large-scale new energy access; The stability analysis of power network with multiple feed HVDC lines; Evolution mechanism analysis of offshore wind power convergence failure.

③HVDC protection engineering scheme and maintenance working group: Longitudinal protection of DC lines based on measured wave impedance phase characteristics.

④Dc control protection simulation test technical working group: Research on high-precision equivalent modeling technology for large-scale new energy; High-precision modeling of large-scale new energy transmission multi-terminal DC transmission system; Modeling of hybrid DC output system for 6000MW offshore wind power based on diode.

⑤HVDC engineering system integration and complete work plan research working group: Old DC equipment control protection system transformation technology; Dc digital intelligent technology application.

⑥HVDC Control and protection system engineering commissioning scheme Working group: Research on offshore flexible DC system commissioning scheme for large-scale wind power transmission.

2) IEEE PES Satellite Technical Committee - DC Power System DC Distribution Network Technical Sub-Committee

AC/DC hybrid distribution network coordination planning, multi-energy complementary flexible interconnection intelligent distribution network topology design, DC distribution system operation control strategy technology, DC distribution network voltage stability control technology, multi-energy micro-network optimization scheduling technology, intelligent soft switch technology, DC distribution network fault identification and location technology, power quality management technology.

3) IEEE PES Satellite Technical Committee - DC Power System DC Transmission and Transformation Equipment Technical Sub-Committee

Submarine cable, DC GIL, DC transformer, digital twin, etc.

4) IEEE PES Satellite Technical Committee - DC Power System DC Transmission and Distribution System Simulation Technical Sub-Committee

From the perspective of the exchange of activities, the members of the Sub-Committee believe that the fine simulation of grid equipment, large-scale new energy simulation, and how to improve the supporting role of simulation technology in the test, analysis and control of new power systems deserve attention and investment.

5) IEEE PES Satellite Technical Committee - DC Power System DC System Planning and Design Technical Sub-Committee

Research and discussion on new technologies related to large-scale new energy through multi-terminal flexible DC transmission, low-frequency offshore wind power transmission system, valve hall design of offshore wind power DC transmission system, and new grounding design of HVDC transmission system will be focused on.

6) IEEE PES Satellite Technical Committee - DC Power System Low Voltage DC Technical Sub-Committee

The Low Voltage DC Technology Sub-Committee held annual meetings and sub-forums at the IEEE DCTS conference to discuss the development of low voltage DC technology in recent years. The Sub-Committee is concerned that with the high proportion of distributed photovoltaic access and a large number of flexible loads (smart buildings, air conditioners, electric vehicles, etc.), the future low-voltage DC technology to serve the urban and new rural development is urgent, optical storage direct soft integrated equipment, urban distribution network AC and DC transformation, air conditioning flexible load centralized regulation is the focus of future research.

8. Global Involvement

- 1) Several technical backbones have been developed into Chinese representative experts for ISO, IEC, and CIGRE due to their outstanding contributions in the field of standards.
- 2) Participate in the IEC international standard proposal project, set up a domestic expert working group, and organize the preparation of draft standards.
- 3) Participate in the establishment of IEEE PES EEDC Power System Committee and the promotion of future work.

9. Problems and Concerns:

- 1) Enhance the role of the platform to provide more and better opportunities for members of the Committee to share and communicate.
- 2) Improve organizational cohesion and collaborate in planning major tasks.
- 3) The heads and work directions of some working groups are out of step with the current work of the corresponding Sub-Committees and should be adjusted.
- 4) The current low voltage DC key equipment cost is still high, in addition, the lack of conducive to the promotion of standards to help the industry landing.

10. Significant Plans for the Next Period:

1) IEEE PES Satellite Technical Committee - DC Power System DC Transmission Control and Protection Sub-Committee

①Advancing the Standardized Operation of the Subcommittee: The Subcommittee will organize technical research and exchanges across all working groups in accordance with the requirements of the IEEE PES DC Transmission Control and Protection Subcommittee Operations Manual. The Subcommittee will consistently expand its membership by inviting experts in the field of DC control and protection, further strengthening its organizational capacity. Leveraging its official website, the Subcommittee will carry out activities such as publicity, technical intelligence collection and sharing, and information disclosure.

②Supporting Technical Exchange Activities across Working Groups: The Subcommittee will organize large-scale technical forums for all members and invite industry experts to deliver specialized reports. The Subcommittee will host technical exchange meetings for each working group, encouraging the sharing of the latest achievements in theoretical research, technological innovation, and engineering applications regarding emerging trends and hot-button issues. The Subcommittee will extensively solicit IEEE standard proposals and actively advance the project approval and declaration process for existing standards.

2) IEEE PES Satellite Technical Committee - DC Power System DC Distribution Network Technical Sub-Committee

- ①The Subcommittee will organize the 4th session of its 1st term and the 2026 Annual Meeting to summarize operational progress and clarify a strategic work plan for the next 1–2 years. The meeting will explore collaborative models and achievement transformation strategies among member units, while facilitating the rotation of selected members and the restructuring of working groups.
- ②The Subcommittee will hold the internal technical forum to exchange cutting-edge technologies and research results in this field.
- ③The Subcommittee will organize/coordinate member units to carry out the research, declaration and formulation of IEEE standards in a timely manner.
- ④The Subcommittee is committed to fostering communication among its members and will actively participate in the work meetings and technical discussions organized by IEEE PES DC current System Technical Committee and IEEE PES.

3) IEEE PES Satellite Technical Committee - DC Power System DC Transmission and Transformation Equipment Technical Sub-Committee

- ①Technical Exchange: The Subcommittee plans to conduct at least one specialized technical exchange activity to deepen academic cooperation with international and domestic peers. Simultaneously, the Subcommittee will strengthen member management, placing high importance on the professional quality and active engagement levels of its members.
- ②IEEE Standard Proposal: The Subcommittee will organize 1–2 experience-sharing sessions and seminars focused on the planning and application of IEEE standard proposals. By encouraging members to actively initiate standard proposals, the Subcommittee aims to develop 1–2 new IEEE standard proposals within the year.
- ③Participation in the Technical Committee Annual Meeting: The Subcommittee will participate in the 2026 Technical Committee Annual Meeting and deliver the annual progress report on behalf of the Subcommittee.

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5) IEEE PES Satellite Technical Committee - DC Power System DC System Planning and Design Technical Sub-Committee

①Subcommittee Operations: The Subcommittee will organize technical seminars on the latest advances in DC transmission technology. The Subcommittee will be responsible for organizing and convening its 2026 Annual Meeting.

②Research Reports: The Subcommittee will complete the drafting of the research reports titled "Research on Converter Station Valve Hall Design" and "Research on New Grounding Electrode Technologies".

③Technical Standards: The Subcommittee will advance the voting, revision, and approval procedures for the international standard IEC 60071-14: Application guidelines for AC/DC filters. The Subcommittee will organize the standard application process for the "Design Guidelines for Insulation Coordination of VSC-HVDC Systems" and the "Design Guidelines for Start-up Circuits of High-Voltage VSC-HVDC Systems". Furthermore, the Subcommittee will oversee the revision of the "Design Guidelines for HVDC Grounding Electrodes".

6) IEEE PES Satellite Technical Committee - DC Power System Low Voltage DC Technical Sub-Committee

①Vigorously promote the internationalization process of the low-voltage DC Sub-Committee. The Subcommittee will actively participate in the low voltage DC related online conference organized by IEEE PES, and keep close contact with PES DC related experts. The Subcommittee will establish strategic connections with international LVDC-related enterprises to jointly conduct technical exchange activities. Leveraging the technical and market advantages of its member enterprises, the Subcommittee is committed to leading the global outreach of China's professional LVDC technologies. Furthermore, the Subcommittee will recruit experts and scholars with an international perspective to collaborate on various online and offline exchange activities.

②Vigorously carry out technical exchange activities based on virtual platforms. The Subcommittee will organize a large-scale technical forum for all members. Utilizing internet platforms, the Subcommittee will release educational videos on LVDC knowledge and systematically introduce relevant application research. In 2026, the Subcommittee strives to host multiple online technical seminars and science popularization webinars, inviting industry experts to conduct in-depth analyses of hot-button LVDC issues.

Submitted by: Yining Zhang

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