

## IEEE Power and Energy Society Entity Annual Report

2021

**Entity:** Power System Communications and Cybersecurity Committee  
**Website:** <https://site.ieee.org/pes-pscc/>  
**Chair:** Craig Preuss  
**Vice-Chair:** James Formea  
**Secretary:** Marc Benou  
**Immediate Past Chair:** Ken Fodero

### 1. Significant Accomplishments:

#### **C0 – Power Line Carrier Subcommittee**

- 1) The C0 Subcommittee's C93.5 working group revised IEEE Std C93.5 Power Line Carrier Transmitter/Receiver Equipment used to Transfer Discrete Teleprotection Signals. An interesting thing happened after balloting was complete: Editorial review discovered a table was missing from the draft! The working group worked quickly to remediate the problem, gaining approval to create a corrigendum before publication to ensure the content was complete and only one version was published. By the end of 2021 the corrigendum was ready for ballot.
- 2) Working group C1 continued work on updating IEEE Std 643 – Power Line Carrier Applications. Monitoring and testing updates will be added, and the overall document will be re-organized for clarity. Sections on modal analysis were updated for accuracy and context. The working group will extend their PAR as more contributions are coming in from new attendees.
- 3) C0 concluded a study group to review the need to update and revise IEEE Std C93.4 – Power Line Carrier Line Tuning Equipment (30 kHz to 500 kHz) Associated with Power Transmission Lines. Updates were needed to include new testing methods as well as an Annex on the relationship of tuner bandwidth to power system values like line impedance and coupling capacitor value. The study group will transition to a working group in 2022 to start on the revision.

#### **E0 – Wire Line Subcommittee**

- 1) Completed balloting of IEEE P820-2005, Telephone Loop Performance Characteristics.
- 2) Completed initial ballot and comment-driven revisions for P487.3a, changes to IEEE Std 487.3-2014, Electrical Protection of Communication Facilities Serving Electric Supply Locations Through the Use of Hybrid Facilities. Requirements were added for new technology to isolate DC power from the power station to the Copper Fiber Junction (CFJ).
- 3) Completed revision of IEEE Std 1692-2011, Protection of Communication Installations from Lightning Effects. Clarifications and correction of minor errata were included as reported by the user community and addition of ac power isolation methodology for lightning and power ground potential rise protection.
- 4) Completed Study Group review with expanded participation (using outside industry SMEs) and initiated revision for changes and corrections to IEEE Std 367-2012, Determining the Electric Power Station Ground Potential Rise and Induced Voltage from a Power Fault.

### **F0 – Optical Fiber Subcommittee**

- 1) Publication of IEEE Std 1138: Testing and Performance for Optical Ground Wire (OPGW) for Use on Electric Utility Power Lines
- 2) Final ballot resolution for IEEE P1595 - Testing and Performance for Optical Phase Conductor (OPPC) for Use on Electrical Utility Power Lines. Intend on publication early in 2022. PAR extension to Dec 2022 has been requested.
- 3) Finalized recommendation to T&D Committee’s working group updating IEEE Std 524 - Installation of Overhead Transmission Line Conductors on sheave and bull wheel sizes for installation of aerial fiber optic cables (optical ground wire [OPGW], ADSS, helically wrapped [Skywrap] and Optical Phase Conductor [OPPC]). Care has been taken to ensure that the recommendation is acceptable to both manufacturers as well as end users and installation service providers.
- 4) Substantially updated Table Q in IEEE Std 525 - Design and Installation of Cable Systems in Substations and provided to the Substations Committee Working Group D2.
- 5) Provided external representation to the IEC and ITU.

### **P0 – Protocols and Architecture Subcommittee**

The P0 Subcommittee work consisted of ten Working Groups on active PARs, two Study Groups, and two Task Forces. Significant accomplishments include:

- 1) The P8 Task Force published PES-TR74 technical report on the “Recommended Mapping Approach between IEEE C37.118.2 and IEC 61850”. In addition to completing that work, the task force made a presentation at the April NASPI meeting along with a presenting at the PAC World conference.
- 2) The P20 Working Group formed as the Dual Logo Maintenance Team (DLMT) for the joint revision of IEC 61850-9-3 IEC/IEEE International Standard - Communication networks and systems for power utility automation – Part 9-3: Precision time protocol profile for power utility automation. The P0 Subcommittee is the lead and Convener of the joint work.

### **S0 – Cybersecurity Subcommittee**

- 1) The S1 Working Group began balloting and started resolving comments for IEEE P1686 – IED Cybersecurity Capabilities.
- 2) The S3 Working Group completed its work with the publication of IEEE Std 2030.102.1 – Interoperability of IPSEC Utilized within Utility Control Systems.
- 3) The S13 Working Group readied IEEE P1547.3 – Cybersecurity of DERs Interface with Electric Power Systems for ballot. The PSCCC is a co-committee with IEEE PES SCC 21 in this work.
- 4) The S15 Working Group started to develop IEEE P2030.100.2 – Securing Generic Object Oriented System Events (GOOSE) and Sampled Values (SV) Protocols of IEC 61850 using IEC 62351-6 and IEC 62351-9.
- 5) The S14 Task Force started work developing a report on using TLS in power system applications.
- 6) The S16 Task Force started work developing a report on systems for detecting and preventing network intrusions in electric power systems.
- 7) The S6 Task Force’s Report on IoT for Connected Home was approved and published as PES-TR89.

The PSCCC also supported its educational outreach goals by reviewing 21 paper submissions to the 2021 PES General Meeting. In addition, the PSCCC created training in 123Signup for our officers at every

level of the Committee. Ironically, this training was held just prior to the announcement that 123Signup was being discontinued! Our Administrative Subcommittee continued meeting bi-weekly in order to address the planning and preparation of what used to be face-to-face meetings, but also to keep working on items important to the PSCCC, such as our P&Ps, awards, standards coordination, and other issues raised by our members (e.g., questions on our P&Ps). Many of our subgroups are now also meeting on a consistent basis to support their work, holding bi-weekly or monthly meetings as needed to continue work, such as creating a draft, addressing comments, or reviewing industry presentations.

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

Updates to PSCCC standards provide valuable tools for manufacturers, test laboratories, communications service providers and power utilities who utilize inter-station fiber optic cables as a part of their telecom/protection networks.

The power line carrier standard IEEE Std 643 was last revised in 2004. Since then, much industry work has taken place on carrier holes and other important considerations for power line carrier applications. These will be added for the education and benefit of the industry.

Critical technical details supporting use of the protocol-based and cybersecurity standards necessary for smart grid, digital substation, and grid automation applications.

Updates to wireline standards provide valuable tools for communications service providers and power utilities, and industry consultants who utilize and maintain wire-line voice-grade and broadband facilities for communications networks with endpoints at power stations. In particular, new/revised reference material and improved clarity of engineering guidelines and applications of the IEEE Std 367 ground potential rise and IEEE Std 487 high voltage interface standards, as well as guidance for advanced lightning effects protection, should offer significant increases in value to the user community.

## **3. Benefits to Volunteer Participants from the Committee Work:**

The PSCCC carefully structures its meetings using a combination of face-to-face and virtual formats to increase volunteer participation. This combination provides a great opportunity for interaction between manufacturers, utilities, research institutions like national laboratories and educational institutions, and consultants. New members and guest participants help increase salience in updated standards while supporting continuity of established knowledge and techniques in the industry. Participants continually benefit from knowledge sharing and collaboration while solving challenges encountered in developing and updating our standard documents, technical reports, tutorials, panel sessions, and other outputs. Presentations from new members and guest participants are included in meetings to increase efficacy and allow knowledge transfer. Participants can provide input into the process of developing standards and other work, giving the participants the opportunity to increase their knowledge in new areas. Participants can discuss their experiences with and strategies for communication-based technologies and architectures applied to power system protection, automation, and control.

## **4. Recognition of Outstanding Performance:**

The PSCCC recognizes the outstanding performance of the following people:

- 1) Ron Farquharson continues to lead the IEEE Std 1815 (DNP3) development and has done so for the past 10+ years. His leadership keeping DNP3 in the forefront of necessary industry protocols has been outstanding.
- 2) Kevin Easley led the revision of IEEE Std 1615 Network Communication for Electric Power Substation Monitoring and Control. He was chair through publishing before he exited the industry in 2021. His commitment will be missed in the P0 Subcommittee.
- 3) Yi Hu led the completion of the Report “Recommended Mapping Approach Between IEEE Std C37.118.2TM-2011 and IEC 61850” and its summary paper. His contribution to the understanding of synchrophasors showcases the expertise of our members.
- 4) William A. Byrd, former Chair of F0 was nominated and accepted for IEEE recognition award in 2020. Mr. Byrd managed this subcommittee very effectively for 20+ years. Due to COVID-19, the award has not been presented as there has not been a face-to-face meeting in 2021.
- 5) Dom Fontana (Eversource) who was a consistent contributor to the C0 Subcommittee but retired from IEEE service in 2021.
- 6) Still in queue due to pandemic-induced awards delays- Percy E. Pool (IEEE Senior Member, S.A. #05727995), submitted in 2019 for significant contributions to standards work.
- 7) Ed Cenzone for the completion of his six year term as Standards Coordinator for the PSCCC.

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

The C0 subcommittee coordinates with the PES Transformers Committee and its Instrument Transformers Subcommittee on updating IEEE PC57.13.9, Power-Line Carrier Coupling Capacitors and Coupling Capacitor Voltage Transformers. This standard will be updated to include the carrier-specific content from the previous standard IEEE/ANSI C93.1-1999, Requirements for Power-Line Carrier Coupling Capacitors and Coupling Capacitor Voltage Transformers. C0 continues to provide input throughout the draft development process. The C0 chair and vice-chair are coordinating directly with the PC57.13.9 working group chair and plan to attend the next working group meeting.

The F0 subcommittee:

- 1) Liaisons with Wireline Subcommittee (PSCCC E0) to help ensure harmonization with wired system communications circuits and networks.
- 2) Liaisons with PES T&D Committee working on IEEE Std 524, where a more comprehensive collaboration is envisioned.
- 3) Liaisons with PES Substations Committee D2 working group, providing comments on the IEEE Std 525, Design and Installation of Cable Systems in Substations. The F0 chair participates in a subgroup set up within D2 to deal with grounding issues.
- 4) Liaisons with IEC on testing standards, specifically for ADSS.
- 5) Liaisons with ITU on fiber optic standards.
- 6) Collaboration with CIGRE at member level and supported by officers: CIGRE JWG D2 B2.39 (TB-746 published) and currently (2021) WG 1 B1.73 Recommendations for the use and testing of fiber optic cables used in land cable systems.
- 7) Liaisons with IEEE Smart Grid.

The S0 Subcommittee works closely and coordinates with the PSRC Committee.



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The P0 subcommittee works with the IEEE PES Substations Committee, T&D Committee, PSRC Committee; and IEC TC57.

The E0 subcommittee liaisons with :

- 1) IEEE External Representative to NFPA70 (National Electrical Code) Panel 16 Principal (Bill McCoy) sponsorship and input to directed votes for National Electrical Code development.
- 2) Member Liaison input to NFPA70 (National Electrical Code) Correlating Committee and other Panels, NFPA 780 (Lightning Protection Systems), IEEE C2 (National Electrical Safety Code), and other Task Groups.
- 3) Member Liaison to PSCCC F0 (Optical Fiber SC) for various standards maintenance in progress.
- 3) Member Liaison input to Substations Committee Working Group D2 for IEEE Std. 525, Design and Installation of Cable Systems in Substations.

The PSCCC main committee liaisons with CIGRE D2 (Dennis Holstein), IEC TC57 WG15 (Marc Lacroix), NEC (Bill McCoy). The PSCCC is representing the PES in the IEEE Digital Privacy Initiative that began in late 2021. PSCCC members are also involved in supporting the IEEE-NERC Joint Task Force developing the Joint IEEE PES-NERC Technical Report on Integration of Cyber and Physical Security into Bulk Power System Planning, Operations, Design, and Restoration Activities.

The PSCCC also has a liaison with the P1952 Working Group developing this IEEE Standard for Resilient Positioning, Navigation and Timing (PNT) End-User Equipment that involves multiple industry sectors. Theo Laughner is our liaison with the iGET (Intelligent Grid and Emerging Technologies) coordinating committee. Craig Palmer is our liaison with the Marine Systems Coordinating Committee.

## **6. New Technologies of Interest to the Committee:**

The P0 Subcommittee is working on new streaming protocols and data exchange that could open new possibilities in wide area efficiencies for large scale power systems data exchange between different entities that are not communicating via standard protocols today (e.g., electric utilities to public safety answering points and government agencies). The P10 working group is developing a new protocol for the industry called the “Streaming Telemetry Transport Protocol”. The P21 Study Group is investigating System Architectures Supporting the Virtualization of Substation Protection and Control Applications. This is another new area being investigated that has keen interest in the P0 Subcommittee. Work on all DER related interfaces has strong interest in the industry, and the P0 Subcommittee has five active working groups in this space, most as co-committees with the T&D Committee, PSRC Committee, and SCC 21.

Distributed Strain and Temperature Sensing (DSTS) is of interest to F0 Subcommittee members, utility end users and manufacturers/test labs for spatial and temporal monitoring of strain and temperature along aerial fiber cables, specifically on OPGW and ADSS. A presentation on this topic was completed at the September 2021 meeting. DSTS technology allows remote monitoring and characterization of fiber cables without taking them out of service. In addition, F0 Subcommittee will investigate available literature and develop standard tests to establish End Of Life (EOL) times for all aerial optical fiber cables. Predictive models may be developed as part of this work. Finally, the F0 subcommittee will coordinate with IEEE Smart Grid group in order to work on fiber optic design and implementation related issues specifically in distribution power system environment.

The C0 Subcommittee is interested in new technologies for protective gaps and for monitoring devices related to Power Line Carrier applications. Both have been developed since the last revision of the standard.

### 7. Global Involvement

The PSCCC supports increasing involvement from Regions 8, 9, and 10 (Africa, Europe, Middle East, Latin America, Asia and Pacific) with the following members from those regions:

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
114	0	2	9

### 8. Significant Plans for the Next Period:

The P0 Subcommittee will support joint revision of IEC 61850-9-3 with IEC TC57/WG10 and complete the work in 2022. They will support co-committee work revising P1854 with the T&D Committee. The revision of IEEE PC37.118.2 should near completion. Finally, continued work is expected on IEEE P2030, P1615, and P1815.

The F0 subcommittee will:

- 1) Work on IEEE P1595 Testing and Performance for Optical Phase Conductor (OPPC) for Use on Electrical Utility Power Lines for publication in Q1 2022.
- 2) Complete revisions to IEEE P1591.1 Testing and Performance of Hardware for Optical Ground Wire (OPGW) Optical Ground Wire, with the goal of publication in 2022. PAR expires in December 2022.
- 3) Complete revisions to new standard P1591.4: Testing and Performance of Hardware for Optical Phase Conductor (OPPC) wire, with the goal of publication in 2022. PAR expires in December 2024.
- 4) Work closely with the IEEE 524 working group to help re-write additional sections of the IEEE Std 524 that handles installation of aerial optical cables (OPGW, ADSS, Skywrap and OPPC).
- 5) Investigate the need for creating a new standard for splice /joint boxes serving optical aerial cables. This standard will allow type testing of various types of splice boxes and areas of concern.
- 6) Further investigate the effect of variation in X/R in calculating short circuit and its specification for both OPGW and OPPC. The size of aerial cable - especially OPGW and helically applied cable - short circuit ( $I^2R$ ) can be affected when different X/R is taken into account.

The P0 subcommittee will continue work on P1711 Standard for Cryptographic Protocol for Electric Power System (EPS) Communication Links, P1711.1 Standard for Serial SCADA Protection Protocol (SSPP), PC37.240 Cybersecurity Requirements for Power System Automation, Protection and Control Systems, P2808 Standard for Function Designations used in Electrical Power Systems for Cyber Services and Cybersecurity, P2658 Guide for Cybersecurity Testing in Electric Power Systems, P1547.3 Guide for Cybersecurity of DERs Interface with Electric Power Systems, and P2030.100.2 Guide for Securing



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Generic Object Oriented System Events (GOOSE) and Sampled Values (SV) Protocols of IEC 61850 using IEC 62351-6 and IEC 62351-9.

The E0 subcommittee expects to:

- 1) Publish revisions to IEEE Std 820
- 2) Publish revisions to IEEE Std 1692
- 3) Publish new Addendum to IEEE Std 487.3a (new technology inclusion)
- 4) Publish new Addendum to IEEE Std 487a (new Guide)
- 5) Complete the revision of IEEE Std 367

**Submitted by: Craig Preuss, PSCCC Chair**

**Date: 1/31/2022**