

IEEE Power and Energy Society Entity Annual Report

2020

Entity: Power System Operation, Planning and Economics Committee (PSOPE)

Chair: Fran Li

Vice-Chair: Jianhui Wang

Secretary: François Bouffard

TCPC: Ramteen Sioshansi

Past-chair: Luiz Barroso

1. Background on PSOPE

PSOPE covers the philosophies, methodologies, practices and tools for operation, planning and economics of interconnected and insular power systems. It sponsors the following five subcommittees:

- Bulk Power System Operation (BPSO);
- Bulk Power System Planning (BPSP);
- Distribution System Operation and Planning (DSOP);
- Power System Economics (ECON); and
- Technologies and Innovations (T&I).

PSOPE is the largest committee in the IEEE PES.

As opposed to many of the PES Committees, PSOPE does not focus on *standards*. Each of its subcommittees produces two types of deliverables: (i) organization of panel sessions and tutorials at annual general meetings on relevant topics; (ii) production of reports, papers and webinars to be made available at [PES Resource Center](#). PSOPE's [webpage](#) is updated and describes in details the scope of each subcommittee.

PSOPE meets yearly, at the annual PES general meeting. Two meetings are carried out: an administrative meeting, which is restricted to PSOPE's officers, and a "main committee" meeting, which is open to all interested attendees.

PSOPE produces two types of technical deliverables: those related to annual PES general meetings (e.g., panel sessions, super sessions, and awards) and those which are non-related to annual PES general meetings (e.g., reports, webinars, and papers).

2. Significant accomplishments

PSOPE's accomplishments during 2020 have come on 4 sides: (i) PSOPE's activities in 2020 PES General Meeting (GM); (ii) materials to PES Resource Center; (iii) actions to promote PSOPE; (iv) participation of PSOPE in the PES technical retreat; and (v) introduction of a new set of administrative procedures to improve its governance and to stimulate meritocracy and focus on non PES-GM deliverables. These accomplishments are detailed below.

(i) PSOPE in 2020 PES GM

On the first item, PSOPE had a very successful technical program at 2020 PES GM. The numbers of papers submitted and included in the meeting program are summarized in the table below, which provides a comparison with 2019 PES GM:

	2019	2020
Total papers submitted	352 (out of 1203 for the full conference, 29%)	295 (out of 1282 for the full conference, 23%)
Committee Conference paper quota	184	183
Transaction papers	50	47
Conference paper accepted	181 (out of 641 for the full conference, 28%)	135 (out of 661 for the full conference, 20%)
Conference paper rejected	171 (49% acceptance ratio)	160 (46% acceptance ratio)
Best paper	19	16
Paper forum session	56	44
Poster session	106	75

PSOPE sponsored 1 Tutorial:

1. Machine Learning and Big Data Analytics in Smart Grid (8 hours, 7 speakers)

PSOPE conducted 31 panel sessions in total, as listed below. All these panels were selected through a voting process and an objective criterion, which was introduced during 2019.

The complete list of sessions is provided below (with comparisons to 2019 figures).

Bulk Power Systems Planning SC (4; 5 during 2019)

1. How Internet Thinking Changes Energy Systems
2. Addressing Computational Challenges in Power System Planning
3. Transmission Planning in a World of Increasing Uncertainties
4. Machine Learning for Power System Planning and Operation

Bulk Power Systems Operations SC (7; 8 during 2019)

1. Application of Machine Learning in Emergency Control for Resilient System Operation
2. Open-Source Bulk Power System Operations Models
3. Data-Quality Aware Synchrophasor Applications
4. Leveraging Demand Side Flexibility to Support System Operations
5. State Estimation for Power Electronics-Dominated Systems: Challenges and Solutions
6. Flexible and Resilience Operation of Interdependent Power and Water Networks
7. DERMS Creating DER Flexibility & Reliability

Distribution System Operation & Planning SC (5; 5 during 2019)

1. The Role of DMS/ADMS in Mitigating Anomalous Distribution Grid Operations
2. Novel ICT Infrastructure Developments to Enable Increased TSO-DSO Business and System Related Interaction
3. Practical Experiences in Grid Reliability and Risk Management
4. Integration Challenges and Solutions of Power Electronic Interfaced Renewable Energy Sources
5. Humanitarian Project and Technologies Enabling Advanced Grid Operations with DER Coordination

Power System Economics SC (8; 8 during 2019)

1. Intelligent Demand-Side Management in Consumer-Centric Energy Systems
2. Price Formation Under Operational Uncertainty
3. Market Design Evolution to accommodate 100% Zero-cost Resources
4. Machine Learning Applications to Energy Forecasting and Analytics
5. DER market integration – opportunities and challenges
6. Test Systems for System Operations, Unit Commitment, System Planning with High Renewable Energy Penetration
7. Methods to quantify and respond to risk in power system planning and operation
8. Integrating Electric Storage Resources and Hybrid Resources in Electricity Market Operations

Technologies & Innovation SC (6; 6 during 2019)

1. Security Constrained Optimal Power Flow: A Review of ARPA-e's First Grid Optimization Competition
2. New Trends with Integrations of Distributed Energy Resources
3. Improving the efficiency of large scale Unit Commitment towards future resource Integration
4. Natural Disaster Mitigation: Best Practices, Methods and Resilience Metrics
5. Methodologies and Technologies for Knowledge Discovery and Data Analytics from Wide Area Monitoring Protective and Control Systems Data-Streaming
6. Transform Grid Planning and Operation Now with Cloud Computing

All these panel sessions were very well attended, and received very positive feedback and compliments from attendees.

PSOPE panel chairs provide a short summary of the proceedings of their panel session. The primary reason for this is to create a record of the panel session to (1) offer people who could not attend a digest of the panel deliberations, (2) provide a record and evidence of Subcommittee, Working Group, and Task Force activities and relevance, and (3) provide feedback to the conference organizers. The reports will be curated and made available to the community on the PSOPE website.

During 2020 PES GM, PSOPE conducted the following 39 Committee, Subcommittee, Working Group, and Task Force meetings.

Main committee (2)

1. PSOPE Committee AdCom
2. PSOPE Main Committee Meeting

Subcommittees (5)

3. Bulk Power System Operations Subcommittee
4. Bulk Power System Planning Subcommittee
5. Distribution System Operation & Planning Subcommittee
6. Power System Economics Subcommittee
7. Technologies & Innovation Subcommittee

Working Groups (15)

8. Working Group on Conventional & Renewable Energy Supply
9. Working Group on Transmission System Planning
10. Working Group on Assessment of Power System Flexibility
11. Working Group on Energy Internet
12. Working Group on Natural Disaster Mitigation Methods and Operation Technology
13. Working Group on Modern & Future Distribution System Planning
14. Working Group on Asset Management
15. Working Group on Distribution Management System
16. Working Group on Sustainable Energy Systems for Developing Communities
17. Working Group on Power System Static and Dynamic State Estimation
18. Working Group on Power System Restoration
19. Working Group on Test Systems for Economic Analysis
20. Working Group on Business Models for Energy Storage
21. Working Group on Demand Response
22. Working Group on Energy Forecasting and Analytics

Task Forces (17)

23. Task Force on Advanced Methods for Computational Intensive Power System Planning Applications
24. Task Force on Benchmarks for Validating Power System Algorithms

25. Task Force on Machine Learning for Power Systems
26. Task Force on Internet of Things for Power Systems
27. Task Force on Advanced Future Bulk Power Systems with Massive Distributed Resources
28. Task Force on Solving Large Scale Optimization Problem in Electricity Market and Power System Applications
29. Task Force on Enabling Paradigms for High-performance Computing in Wide Area Monitoring Protective and Control systems
30. Task Force on Energy Use
31. Task Force on Micro-grids Pre-feasibility Toolkit
32. Task Force on Future TSO-DSO Interaction: Challenges, Business Cases and Solutions
33. Task Force on Dynamic Parameter and State Estimation
34. Task Force on Standard Test Cases for Power System State Estimation
35. Task Force on Operational Tools for Enabling Resiliency
36. Task Force on Cyber-Physical Interdependence for Power System Operation and Control
37. Task Force on Synchrophasor Applications in Power System Operation and Control
38. Task Force on Water-Power Nexus
39. Task Force on Decision Support Tools for Energy Storage Investment and Operations

These committee meetings were very well attended, and increased significantly international and industry participation.

Thank you to all our session organizers and chairs in putting together a very successful technical program for PSOPE. Special thanks go to the sub-committee vice-chairs for their hard work and enthusiasm with the running of the review process!

(ii) Non-PES GM deliverables

To bring values to the industry, and also advertise committee activities, PSOPE has been encouraging members on developing deliverables that go beyond panel sessions at the PES GM, such as webinars, report and papers. The following webinar was delivered in 2019:

- Dynamic State and Parameter Estimation for Power System Monitoring, Modeling and Operation- November 2020. It is available here: https://resourcecenter.ieee-pes.org/education/webinars/PES_Ed_Web_DSPE_110620.html
- Dynamic State and Parameter Estimation for Power System Control and Protection Webinar- November 2020. It is available here: https://resourcecenter.ieee-pes.org/education/webinars/PES_Ed_Web_DSPE2_110620.html
- IEEE TF paper by Dynamic State and Parameter Estimation TF - J. B. Zhao, M. Netto, Z. Huang, S. Yu, A. Exposito, S. Wang, I. Kamwa, S. Akhlaghi, L. Mili, V. Terzija, A. P. Sakis Meliopoulos, B. Pal, A. K. Singh, A. Abur, T. Bi, A. Rouhani, "Roles of Dynamic State Estimation in Power System Modeling, Monitoring and Operation," IEEE Trans. Power Systems, 2020.

- Nine new websites for Task Forces and Working Groups have been developed:
 - WG on Power System Static and Dynamic State Estimation developed their website at: <https://cmte.ieee.org/pes-pssdse/>
 - TF on Advanced Methods for Computationally Intensive Power System Planning Applications (CIPSPA): <https://site.ieee.org/pes-cipsa/>
 - TF on Sustainable Energy Systems for Developing Communities: <https://site.ieee.org/pes-sesdc/>
 - WG on Business Models for Energy Storage: <https://site.ieee.org/pes-psope/subcommittees/power-system-economics-subcommittee/working-group-on-business-models-for-energy-storage/>
 - WG on Demand Response: <https://site.ieee.org/pes-psope/subcommittees/power-system-economics-subcommittee/working-group-on-demand-response/>
 - WG on Test Systems for Economic Analysis: <https://site.ieee.org/pes-psope/subcommittees/power-system-economics-subcommittee/working-group-on-test-systems-for-economic-analysis/>
 - WG on Energy Forecasting and Analytics: <https://site.ieee.org/pes-psope/subcommittees/power-system-economics-subcommittee/working-group-on-energy-forecasting-and-analytics/>
 - TF on Machine Learning for Power Systems: <https://cmte.ieee.org/pes-mlps/>
 - TF on Internet of Things for Power Systems: <https://cmte.ieee.org/pes-iotps/>
- A beta version of Excel-based tool for microgrid pre-feasibility toolkit has been discussed by the WG on Sustainable Energy Systems for Developing Communities (SESDC).
- WG on Distribution Management System discussed that the proposed DMS activities including quarterly web working session calls, and the possibility of developing an IEEE guide on DMS to be further discussed in the upcoming working calls. The group discussed setting up an official IEEE PES web page for the group.

(iii) Actions to promote PSOPE

PSOPE has also continued the actions to promote the committee:

- Preparation of a flyer, following a similar look and feel to all of the committee flyers, with consistent messaging and branding. The flyer was printed and distributed during the Monday evening Poster Session at the PES General Meeting.
- Committee Palm Card: printed as a 2-sided piece and distributed at the PES General Meeting at registration, at the PES booth, during the poster session and other places where appropriate. The idea is that potential new members can see at a glance what our committee is about and know who to contact for more information if they are interested.
- Development of a number of IEEE websites of WGs and TFs to allow easier search for current and past focused activities (also see Section 2.(ii)).

(iv) Technical retreat

PSOPE participated in the IEEE-PES Technical Council January 2020 Strategic Planning Retreat, held in Jacksonville, FL, during January 12-13, 2020, and the November 2020 Strategic Planning retreat, held virtually during November 12-13, 2020.

(v) Improving Governance Procedures

PSOPE's officers have been working jointly to stimulate all of its working groups (WG) and task forces (TF) to produce deliverables that go beyond panel sessions in PES GM. WG and TF should not be simple placeholders for panel session (slots) for the GM. Those not producing a concrete deliverable plan will be disbanded. WG and TF chairs were requested to prepare a balance of its recent deliverables and of its planned ones, so that the committee can have a deliverable plan. With the implementation of the platform 123Signup by the Technical Council, it is expected the committee will have a common platform to share information and track its deliverables.

PSOPE has developed the 123Signup system for the committee rosters and meeting attendance per instruction from the PES Tech Council.

In addition, in an attempt to have a better outreach and information sharing, WG and TF officers were encouraged to create their own IEEE-style websites. During 2020, nine websites for WGs and TFs were created and linked to the respective SC webpages.

PES and Technical Council initiated China Satellite in 2020 with China Chapter. This was discussed at the IEEE PES GM2020 and the November 2020 retreat (virtual). While there are many questions and confusions from technical committees, the PES Technical Council provided five guidelines for integrating China Satellite. Within PSOPE, there was no activity of integrating China Satellite into PSOPE during 2020.

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

By presenting and discussing the operational, planning and economics aspects of power system technologies and operations, PSOPE activities serve as a bridge between academic research and practical applications, help guide research and development activities. In addition, PSOPE shares information about industry experiences and key challenges to provide feedback to the industry regarding the effectiveness of new techniques and methodologies.

The panel sessions, TF/WG/SC/Committee meetings also serve as live forums for academic researchers and industrial practitioners to listen to each other, provide networking opportunities among international participants to establish communication and collaboration.

4. Benefits to Volunteer Participants from the Committee Work:

With more committee activities, such as delivering webinars, preparing reports and papers, organizing and chairing panel sessions, paper forum, transaction paper sessions, as well as creating and organizing Task Forces, Working Groups, PSOPE has attracted more volunteers. Through their contacts with other participants, volunteer participants in PSOPE work gain knowledge and experiences they can apply in their jobs, which can benefit of their careers and organizations

5. Recognition of Outstanding Performance:

PSOPE has an Award Subcommittee in full function. The following awards and IEEE PES Technical Committee Certificates of Appreciation were presented to the following committee members during 2020 PES GM (Online):

- *PSOPE Prize Paper Award (The paper also won the IEEE PES Prize Paper Award)*

Weifeng Li¹, Pengwei Du², and Ning Lu¹

¹ North Carolina State University, Raleigh, NC 27606 USA

² Electric Reliability Council of Texas, Taylor, TX 76574 USA

“Design of a new primary frequency control market for hosting frequency response reserve offers from both generators and loads,” IEEE Transactions on Smart Grid, vol. 9, no. 5, Sept. 2018, pp. 4883 – 4892.

- *PSOPE COMMITTEE DISTINGUISHED SERVICE AWARD*
 - Luiz Augusto Barroso (Chair – PSOPE Committee – 2018 – 2020)
- *Outgoing Subcommittee Chair Recognition*
 - Ebrahim Vaahedi - Outstanding service to Bulk Power Systems Operations Subcommittee
 - Joseph Yan - Outstanding service to Bulk Power System Planning Subcommittee
 - Ning Lu - Outstanding service to Power Systems Economics Subcommittee
 - Mingguo Hong - Outstanding service to Distribution System Operation and Planning Subcommittee
- *IEEE Fellows (Class of 2021)*
 - Dr. Jianhui Wang (PSOPE Vice Chair)
 - Dr. Ramteen Sioshansi (PSOPE TCPC)
 - Dr. Ning Lu (former ECON subcommittee chair)
 - Dr. Hamid Zareipour (Representative to Standard Coordinating).

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

PSOPE coordinates with several other PES committees, notably AMPS, PDSP and T&D, SBLC, and WSPCC. At the committee level, we have appointed three new representative or coordinators: Representative to Standard Coordinating: Dr. Hamid Zareipour, University of Calgary; Liaison to Energy Internet Coordinating Committee (EICC), Dr. Pengwei Du, ERCOT; and Liaison to Renewable Systems Integration Coordinating Committee (REICC): Dr. Xin Fang, NREL.

At the subcommittee level, we have the following a joint activity with another committee:

- A joint panel session, “Advanced Data Analytics for Power Asset Management” at GM20 with the Big Data subcommittee in AMPS.

7. New Technologies of Interest to the Committee:

The major new technologies of interest to PSOPE include the impact on power system operation, Planning and Economics of significant penetration of stochastic generation resources, the operational issues and opportunities related to smart-grid technologies, DER Enabled ADMS and Distributed Energy

8. Significant Plans for the Next Period:

In 2020 PSOPE had the following rotation of committee and subcommittee levels:

Committee level:

- No rotation at the committee level. The next rotation will happen on January 1, 2022.

Subcommittee level:

- **BPSP:**
New Chair: Dr. Pengwei Du, ERCOT, Pengwei.Du@ercot.com
Outgoing Chair: Joseph Yan, Southern California Edison
- **DSOP:**
New Chair: Dr. Murali Baggu, National Renewable Energy Laboratory, murali.baggu@nrel.gov
Outgoing Chair: Mingguo Hong
- **ECON:**
New Chair: Dr. Ramteen Sioshansi, The Ohio State University, sioshansi.1@osu.edu
Outgoing Chair: Andre Luiz Diniz, CEPEL, Brazil.

PSOPE will sponsor and organize technical activities related to 2020 GM, and other IEEE PES conferences, such as T&D, further attract more international and industry participation, as well as participation from young engineers and women engineers. The focus will be to strengthen PES awareness, including developing webinars to introduce and promote committee, and presenting related technical subjects. The governance actions aiming at more concrete deliverables, recognition of meritocracy of the SC/WG/TF will continue and it is hoped that PSOPE will be able to deliver high-quality research and industrial contributions for its members.

9. 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). PSOPE has been continuously expanding its membership basis.

Our state of the art of membership is below (order of magnitude).

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
1000	2	3	250

The BPSO has been involved in creation of the Global Power Systems Transformation Consortium (G-PST). The G-PST presents a promising initiative that could generate increased engagement from power system operators in under-represented regions. PSOPE and BPSO have ongoing and active engagement with the G-PST and will continue to pursue opportunities to expand membership and provide networking opportunities to under-represented regions.

10. Problems and Concerns:

One of the concerns for PSOPE is to focus the outreach and activities of its SC in deliverables that go beyond just the organization of panel sessions. While PSOPE has achieved very well in developing nine new WG or TF websites, we still request all SC, WG and TF chairs to produce more reports, webinars and papers that complement the organization of sessions for the PES GM, in an effort to add more value to the PSOPE members.

PSOPE has also been increasing industry participation through practical and trending topics in its activities, but reaching a fair balance between industry and academia participation in the committee has been a continuous challenge. The effort will continue in 2021, to bring more value to the industry, and is part of a major action by the Technical Council to strengthen the PES awareness.

The unprecedented pandemic of COVID-19 has made PES GM a virtual meeting which gave extra challenges to PSOPE and IEEE PES to get connected in the past year. In particular, it has been a challenging job to recruit new members from Region 8, 9, and 10 and from the industry to be engaged in PSOPE activities.

11. Message from the Chair:

As a new chair of PSOPE since January 2020, I would like to thank all PSOPE officers, specially Vice Chair Jianhui Wang, Secretary François Bouffard and TCPC Ramteen Sioshansi for our excellent team work. PSOPE's past chairs, Luiz Barroso (2018-2019) and Hong Chen (2016-2017), have also provided a superb guidance for our work. I would also like to thank all PSOPE subcommittees, WG, and TF officers and volunteers for your wonderful and unselfish works to help PSOPE complete numerous sessions at the



virtual GM 2020. Despite the pandemic, PSOPE still had many new amazing achievements in 2020. I look forward to having another productive, safe and healthy year of 2021 with every and each one of you.

Submitted by: Fran Li, The University of Tennessee - Knoxville

Date: 1/31/2021