

## IEEE Power and Energy Society Entity Annual Report

2019

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

**Chair: Luiz Barroso**

**Vice-Chairs: Fran Li**

**Secretary: Jianhui Wang**

**TCPC: François Bouffard**

**Past-chair: Hong Chen**

### 1. Significant Accomplishments:

#### *Background on PSOPE*

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

- Bulk Power System Operation;
- Bulk Power System Planning;
- Distribution System Operation and Planning;
- Power System Economics;
- Technologies and Innovation.

PSOPE is one of the largest committees in the IEEE PES.

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

PSOPE meets yearly, at the PES General Meeting. Two meetings are carried out: an administrative meeting, restricted to PSOPE's officers, and a "main committee" meeting, open to all.

PSOPE produces two types of technical deliverables: those related to the PES GM – as panel sessions, super sessions, awards, etc – and those non-related to the PES GM – as reports, webinars, papers, etc.

#### *Significant accomplishments in 2019*

PSOPE's accomplishments in 2018 have come on 4 sides: (i) committee's activities in the 2019 PES General Meeting (GM); (ii) materials to the PES Resource Center; (iii) actions to promote PSOPE; (iv)

on the participation of the committee in the PES Technical Retreat; and (v) on the introduction of a new set of administrative procedures to improve its governance and to stimulate meritocracy and focus on non PES-GM deliverables. They are detailed below.

(i) PSOPE in the 2019 PES GM

On the first item, PSOPE had a very successful technical program at 2019 PES GM. The main numbers of papers are depicted in the table below, which also compares with the 2018 PES GM:

	<b>2018</b>	<b>2019</b>
Total papers submitted	436 (out of 1306 for the full conference, 33%)	352 (out of 1203 for the full conference, 29%)
Committee Conference paper quota	201	184
Transaction papers	63	50
Conference paper accepted	212	181
Conference paper rejected	161	171
Best paper	20	19
Paper forum session	60	56
Poster session	132	106

PSOPE sponsored 4 Tutorials:

1. Transmission System Planning – A Fundamentals Course for Electric Power Engineers, Non-electrical Engineers and Others Working in the Electric Power Industry (8 hours)
2. 21st Century Distribution Management and Operation: The Future is Now! (8 hours)
3. Energy Storage Applications and Best Practices (8 hours)
4. Off-Grid Systems in Developing Countries (4 hours)

PSOPE conducted 34 panel sessions in total, as listed below. All these panels were selected through a voting process and an objective criterion introduced in 2018, see last year’s Annual Report.

The complete list of sessions is provided below (comparing with 2018 figures):

**Bulk Power Systems Planning SC (5; 4 in 2018)**

1. Integrated Resource Planning in California
2. Transmission Planning for Storage: Size and Location
3. Addressing Challenges of Uncertainty Quantification and Data Analysis for Probabilistic Grid Planning
4. Energy Internet and Energy System Integration: Applications and Experiences
5. International Practices in Power System Planning: Processes, Methods and Techniques

### **Bulk Power Systems Operations SC (8; 6 in 2018)**

1. Variable and Distributed Energy Resources Integration in Bulk Power System Operation
2. Harnessing Grid Services from DERs using DERMS solutions
3. Dynamic State Estimation for Power System Monitoring, Protection and Control – Paving the Way for A More Resilient Grid
4. Challenges and solutions for Synchrophasor Data Quality in Power System Operation
5. Deep Learning for Power System Applications
6. The Role of Long-Duration Storage for Supporting the Grid
7. Next-Generation EMS – A Global Perspective
8. Implementation of Remedial Action Schemes in Real-Time Contingency Analysis in Control Centers

### **Distribution System Operation & Planning SC (5; 5 in 2018)**

1. Enabling Advanced Grid Operations with DER Coordination
2. Aggregated Distributed Energy Resources: Impacts on Transmission and Distribution Planning and Operations
3. Incorporating Non-Wires Alternatives into the Planning Process
4. Reliability, Resilience & Risk: The New 3 R's of the Industry
5. Information System Developments to Enable Enhanced TSO-DSO Interaction

### **Power System Economics SC (8; 7 in 2018)**

1. Business Cases for Grid-Connected Energy Storage Systems
2. The Economics of Battery Storage under Different Market Structures
3. Price Formation in Wholesale Electricity Markets
4. Distributed Demand Response Dilemma: Defect or Engage
5. Harnessing the Flexibility of Behind-the-Meter Energy Resources
6. Ensuring Grid Resilience through Policy, Standards and Market Constructs
7. Utility of the Future Platform and Functions
8. Coupling of Electric Power and Natural Gas Systems

### **Technologies & Innovation SC (6; 5 in 2018)**

1. Applications of Optimization Algorithms and Computational Techniques in Large-Scale Electricity Markets: Success and Challenges
2. Real-Time Computing Technologies and Potentials
3. Challenges and Enabling Technologies for Wide Area Protection of Future Power Systems
4. Data-Driven Approaches for Mitigation of Natural Disasters Impacts on Power Grids
5. Benefits of Supergrid with HVDC Overlay
6. Grid Operation and Planning with High Penetration of Distributed Energy Resources

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

PSOPE Committee Officers and Subcommittee chairs (or their representatives) agreed that starting from the 2019 PES GM panel chairs should provide a short summary of the proceedings of their panel session. A template for this report was created by the TCPC. The primary reasons for this is to create a record on the panel session proceedings 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 activity 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.

PSOPE has also organized the Supersession “Risk-Based Transmission Planning and Operation” for the 2019 IEEE PES General Meeting, which was broadcasted live and had a fair attendance.

At the GM 2019, PSOPE conducted 36 committee meetings, as follows:

**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 (14)**

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

### **Task Forces (15)**

23. Task Force on Benchmarks for Validation of Emerging Power System Algorithms
24. Task Force on Advanced Future Bulk Power Systems with Massive Distributed Resources
25. Task Force on Bulk Power System Operations with Variable Generation
26. Task Force on Decision Support Tools for Energy Storage Investment and Operations
27. Task Force on Next-Generation EMS for Advanced future bulk power systems: Challenge, Architecture and Concept
28. Task Force on Real-Time Contingency Analysis
29. Task Force on Voltage Control for Smart Grids
30. Task Force on Future TSO-DSO Interaction: Challenges, Business Cases and Solutions
31. Task Force on Ultra-wide-area HVDC Overlay Studies
32. Task Force on Advanced Methods for Computational Intensive Power System Planning Applications
33. Task Force on Synchrophasor Applications in Power System Operation and Control
34. Task Force on Dynamic Parameter and State Estimation
35. Task Force on Enabling Paradigms for High-performance Computing in Wide Area Monitoring Protective and Control systems (WAMPACs)
36. Task Force on Solving Large-Scale Optimization Problems in Electricity Market and Power System Applications (new)
37. Task Force on Innovative Faster than Real Time Computing Technologies for Power System Online Applications (new)
38. Task Force on Microgrid Pre-Feasibility Toolkit (new)

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

*Thank you to all our session organizers and chairs in putting together a very successful first 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:

- Battery Energy Storage Applications in Power Systems Webinar - November 2019. It is available here: [https://resourcecenter.ieee-pes.org/education/webinars/PES\\_Ed\\_Webinar\\_PSOPE\\_BatteryStorage\\_112019.html](https://resourcecenter.ieee-pes.org/education/webinars/PES_Ed_Webinar_PSOPE_BatteryStorage_112019.html)

More webinars are underway.

(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.

(iv) Technical retreat

PSOPE participated in the IEEE-PES Technical Council 2019 Strategic Planning Retreat, carried out in Las Vegas, NV, during Nov 14-15, 2019.

(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 sessions (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.

Also, in an attempt to have a better information sharing between all committee members, each PSOPE SC now has space in Google Docs where information on the subcommittee activities are made available to all officers.

Also, on what concerns the PES GM, PSOPE has always had a challenge on how to define an objective criterion for the allocation of panel sessions slots among the SC. This is critical because of the size of the committee and the "hard fight" for panel sessions slots within the SC and WG/TF. After a consultation with the Committee-level officers, from 2018, a panel slot allocation formula was proposed by TCPC agreed and already applied for the 2019 PES GM. This is a measure to increase the objectiveness and transparency of the committee. The formula was introduced in 2018, see the 2018 Annual Report.

Also, formal guidelines for panel session organization in PES GM were defined as follows:

- The Committee-level preference is to have 2-hour panels with a limited number of panelists (5-6). It is still possible to organize 4-hour panels. Note, however, that 4-hour long panels consume 2 panel slots each.

- Panel organizers have to play an active role in the organization of their panels. Panels should have a common thread and not be a succession of individual unrelated presentations. It is recommended that panel organizers discuss with their speakers ahead of time how each speaker is addressing different aspects of the panel's theme. A good way forward is to demand panelists to answer some questions or respond to some statement from their personal/business/research/policy perspective. Moreover, each panel session should allocate some time to take questions from the audience and to allow the panelists to engage with each other and the audience. At least 15-20 minutes should be allocated for discussions. A good guide to make sure discussions are lively and interesting for the audience is for the panel chairs to have a some questions ready for all or a subset of the panelists to get the conversation started. Also, it might be interesting to have one of the organizers produce a short text highlighting the main points of each speaker and a summary of the Q&A/discussion at the end. This is worthy to document the proceedings of the session for those who may have missed it.
- PSOPE Committee Officers and Subcommittee chairs (or their representatives) agreed that starting from the 2019 PES GM panel chairs should provide a short summary of the proceedings of their panel session. A template for this report was created by the TCPC. The primary reasons for this is to create a record on the panel session proceedings 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 activity 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.

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

## **2. 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.

## **3. 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

## **4. 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 2019 PES GM:

- *PSOPE Prize Paper Award*

Haoyu Yuan, Fangxing Li, Yanli Wei, Jinxiang Zhu

Paper: *Novel Linearized Power Flow and Linearized OPF Models for Active Distribution Networks with Application in Distribution LMP*. IEEE Trans. On Smart Grid, vol. 9, no. 1, pp. 438-448, Jan. 2018.

- *Recognition Awards for Outgoing Chairs*

Recipient: Avnaesh Jayantilal

Citation: For outstanding service to Distribution System Operation and Planning Subcommittee

Recipient: Hamidreza Zareipour

Citation: For outstanding service to Power System Economics Subcommittee

- *IEEE Fellows (class 2020)*

PSOPE's chair Luiz Barroso was named an IEEE Fellow, being recognized for leadership in analytical methods for power system economics and regulation.

## **5. 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. Coordination sometimes includes joint sponsorship of GM sessions. PSOPE has supported the work of several task forces by providing operational perspectives via a liaison.

## **6. 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

## **7. Significant Plans for the Next Period:**

In 2019 PSOPE had the following rotation of committee and subcommittee levels:

Committee level:

- New PSOPE Chair: Fangxing (Fran) Li, University of Tennessee, US



- New PSOPE Vice-Chair: Jianhui Wang, Southern Methodist University, US
- New PSOPE Secretary: François Bouffard, McGill University, Canada
- New PSOPE TCPC: Ramteen Sioshansi, The University of Ohio, US
- New PSOPE Past-Chair: Luiz Barroso, PSR Energy Consulting and Analytics, Brazil

The rotation of the officers in the subcommittee level is shown below:

**BPSO :**

New Chair: Dr. Masood Parvania, University of Utah, masood.parvania@utah.edu

Outgoing Chair: Ebrahim Vaahedi

**BPSP:**

New Chair: Dr. Pengwei Du, ERCOT, Pengwei.Du@ercot.com

Outgoing Chair: Joseph Yan

**DSOPE:**

New Chair: Dr. Murali Baggu, National Renewable Energy Laboratory, murali.baggu@nrel.gov

Outgoing Chair: Mingguo Hong

**ECON:**

New Chair: Dr. Andre Luiz Diniz, CEPEL, diniz@cepel.br

Outgoing Chair: Ning Lu

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.

## **8. 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	5	250

## 9. Message from outgoing Chair:

As a chair of PSOPE since 2018, I would like to thank all PSOPE officers, specially our vice chair Fran Li, our Secretary Jianhui Wang and our TCPC François Bouffard for all our joint and pleasant work. PSOPE's first-chair, Hong Chen, has also been providing a superb guidance for our work. It's been a learning experience for me to work and learn with you all.

A big thank you also goes also to all our session organizers and SC/WG/TF chairs in putting together a very successful committee. Finally, I also would like to thank all the sub-TCPC and reviewers for their hard work and enthusiasm with the running of the review process of papers for the IEEE PES GM.

I welcome the new PSOPE officers and wish them the best of luck, with the certainty that I will always be around to strongly support the activities of this very relevant committee.

Thank you.

**Submitted by: Luiz Barroso**

**Date: 1/30/2020**