

IEEE Power and Energy Society

Working Group Meeting

Data-Driven Modeling, Monitoring, and Control in Power Distribution Networks

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Activities from Last Year

- › 2023 PES GM Panel Sessions
 - › Learning for Power Distribution System Optimization, Control and Protection
 - › Wednesday 10 am – 12 pm
 - › Chair: Vassilis Kekatos. Co-Chair: Nanpeng Yu
 - › Six Speakers: Baosen Zhang, Anna Scaglione, Nanpeng Yu, Ahmed Zamzam, Vassilis Kekatos, Lang Tong
 - › Machine Learning Applications in Power Distribution Systems
 - › Thursday 1 pm – 3 pm.
 - › Chair: Ning Lu. Co-Chair. Vassilis Kekatos.
 - › Synchrophasor Data Analytics
 - › Tuesday 8 am – 10 am.
 - › Chair: Kaveri Mahapatra. Co-chair: Nanpeng Yu

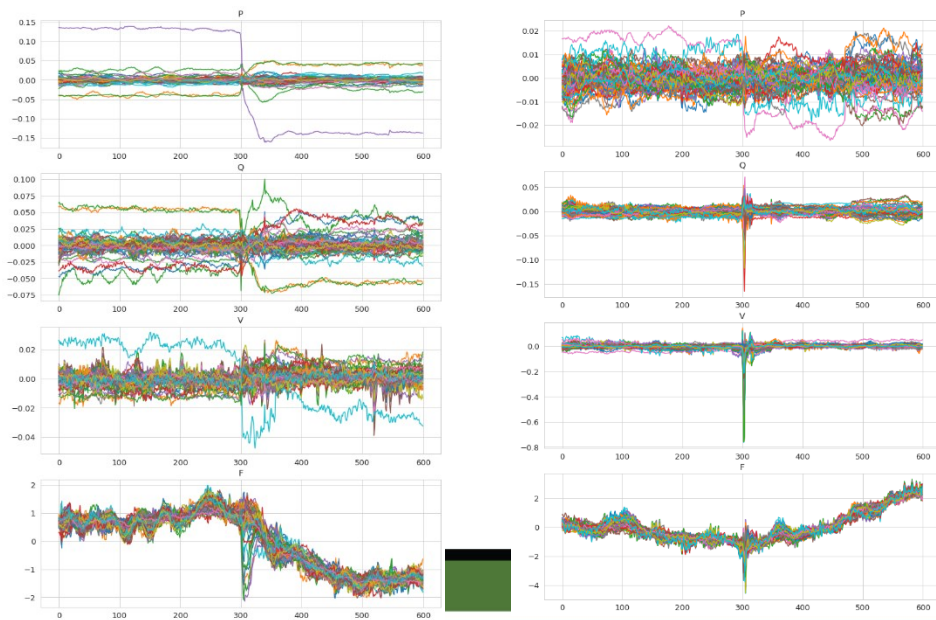
Tasks Group: Data-Driven Control in Power Distribution Systems

- › Held a virtual meeting to discuss plans to prepare a technical report on data-driven control in power distribution systems
- › 95% complete
- › Control applications identified
- › Algorithms summarized
- › Plan to submit technical report to IEEE PES for review in September 2023

Open Source Data Set for PMUs

<https://github.com/NanpengYu/pmuBAGE>

The dataset consists of 84 synthetic frequency events and 620 synthetic voltage events. It is split into several partitions, all found in the "data" subdirectory.



B. Foggo, K. Yamashita and N. Yu,
 "pmuBAGE: The Benchmarking
 Assortment of Generated PMU Data for
 Power System Events," in *IEEE
 Transactions on Power Systems*, doi:
 10.1109/TPWRS.2023.3280430.

New Initiative

- › Brought up by WG vice chair candidate: Po-Chen Chen, Data Science Manager from Exelon's Infrastructure and Safety Analytics
- › Data Scientist for Power System Education
- › Motivation: Data analytics is the foundation of the grid technology. With development of digital technology and cloud computing, the future generation of power system engineers are required to have certain level data skills.
- › Topics: Education, Training, Recruiting, Evaluation
- › Next Steps: We have listed out the industry contacts, mostly from utility companies. The next step is to design the surveys and understand the feedback from utility members.

Planned Activities

- › Panel Session Proposal for GM 2024
- › Technical Report for Task Group
 - › Data-driven topology and parameter estimation in power distribution systems

Data-driven flexibility in decarbonized power distribution systems

Task Force proposal within the WG

Data-driven flexibility in decarbonized power distribution systems Task Force

Aim of this Task Force

- DER and EVs can provide increasingly valuable grid services such as peak reduction or shifting, frequency regulation, voltage support, and load balancing. The visibility of these resources is, however, extremely limited. Data-driven modelling, monitoring, and control allow the definition of new flexibility services at distribution level. The task force will firstly identify gaps in distribution system management (such as, but not limited to, topology and phase identification, customer net load estimation including EV charging/discharging and DER production, parameter estimation etc.), and then it will propose data-driven algorithms to close these gaps, considering data access and availability issues.

Target members

- DSOs, R&D institutions – 15 core members

Deliverables

- The technical report will comprise an overview of the state of the art tools, systems and platforms to support data-driven flexibility solutions in distribution systems around the world. It will take into account transport electrification and DER.
- The technical report will contain data-driven algorithms and an appendix with links to open data repositories from academia and industry

Data-driven flexibility in decarbonized power distribution systems Task Force



Chair

- **Ioana Pisica**, Associate Professor, Brunel University London
- Expertise
 - Agent-based modelling of distribution systems
 - Smart metering communications and analysis of large amounts of data from smart meters
 - ICT infrastructures for future power networks
 - EV-enabled distribution system flexibility
 - Volt/Var control of distribution-connected PV resources



Vice-Chair

- **Pedro Vergara Barrios**, Assistant Professor, TU Delft
- Expertise:
 - Electrical distribution system planning and operation
 - Mathematical programming applied to distribution systems
 - Single- and multi-phase power flow formulations
 - Machine Learning (ML) for distribution systems
 - Integration of renewable energy resources at distribution level



Secretary

- **Chun Sing Lai**, Lecturer, Brunel University London
- Expertise
 - Energy and power system optimisation
 - Energy system modelling,
 - Energy data analytics,
 - Techno-economic analysis, and financial modelling for energy system