



IEEE Task Force on Data Sharing in Energy Systems

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Subcommittee on Big Data & Analytics for Power Systems

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...

Update of General Activities 2023

A Workshop in IEEE SmartGridComm



- Launched a workshop **IEEE SmartGridComm 2022 Workshop on Data Sharing in Smart Grids**

Schedules:

- Time: Oct 27, 2022 (Singapore time)

Chairs:

- Yi Wang, the University of Hong Kong
- Ricardo Bessa, INESC TEC

Institutions:



IEEE SmartGridComm 2022 Workshop on Data Sharing in Smart Grids

Chairs

Yi Wang, Assistant Professor, The University of Hong Kong, yiwang@eee.hku.hk
Ricardo Bessa, Senior Researcher, INESC TEC, ricardo.j.bessa@inesctec.pt

Schedule

Half-day (three hours), Day of the workshop: 27 October, 2022 (Singapore time)

15:00-15:40 Keynote 1:

- Prof. Pierre Pinson, Imperial College London, “Data Markets in Energy Forecasting”

15:40-16:55 Hot topic session:

- Dr. Paul Cuffe, University College Dublin, “Prediction Markets as a Data Aggregation Mechanism”
- Dr. Jianxiao Wang, Peking University, “Market-oriented Data Valuation in Smart Grids”
- Dr. Jean-Francois Toubreau, KU Leuven, “Privacy-Preserving Probabilistic Forecasting in Smart Grids”

16:55-17:35 Keynote 2:

- Prof. Qinglai Guo, Tsinghua University, “Data Sharing: Value, Method and Mechanism”

17:35-18:00 Panel:

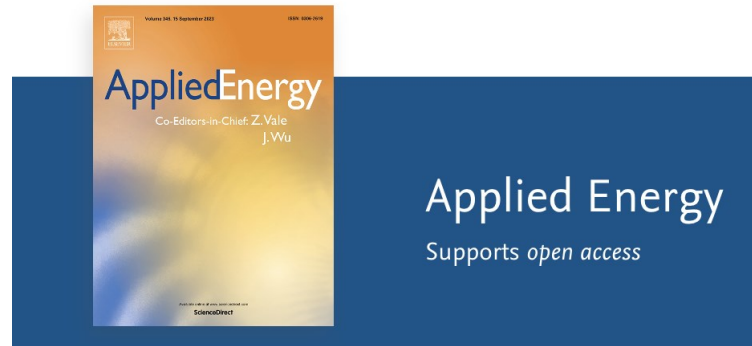
- Discussion between the expert research panel and the audience about the current status quo of data sharing in smart grids and the challenges to their implementation, as well as a realistic assessment of their potential going forward.

A Special Issue in Applied Energy

- Launched a special issue at Applied Energy concerning **Data Openness and Sharing for Low Carbon Energy Systems**



ScienceDirect



Data Openness and Sharing for Low Carbon Energy Systems

Edited by Jianzhong Wu, Fredrik Wallin, Stephanie Pincetl, Mingyang Sun, Yi Wang, Pierre Pinson, Qixin Chen, Qingsong Wen
Last update 25 February 2023

- Invited papers:

Research article Abstract only

Allocation of carbon quotas with local differential privacy

Bo Ning, Xinjian Zhang, Xinyi Liu, Chao Yang, ... Qian Ma
15 November 2022
Article 119974

Article preview

Research article Abstract only

Risk-averse TSO-DSOs coordinated distributed dispatching considering renewable energy and demand response uncertainties

Tao Jiang, Chenghao Wu, Rufeng Zhang, Xue Li, Fangxing Li
1 December 2022
Article 120024

Article preview

Research article Abstract only

A secure forecasting-aided state estimation framework for power distribution systems against false data injection attacks

Junjun Xu, Zaijun Wu, Tengfei Zhang, Qinran Hu, Qiuwei Wu
15 December 2022
Article 120107

Article preview

Research article Abstract only

Wind power forecasting considering data privacy protection: A federated deep reinforcement learning approach

Yang Li, Ruinong Wang, Yuanzheng Li, Meng Zhang, Chao Long
1 January 2023
Article 120291

Article preview

Research article Abstract only

Federated fuzzy k-means for privacy-preserving behavior analysis in smart grids

Yi Wang, Jiahao Ma, Ning Gao, Qingsong Wen, ... Hongye Guo
1 February 2023
Article 120396

Article preview

Research article Abstract only

Privacy-preserving knowledge sharing for few-shot building energy prediction: A federated learning approach

Lingfeng Tang, Haipeng Xie, Xiaoyang Wang, Zhaohong Bie
1 May 2023
Article 120860

Article preview

Research article Open access

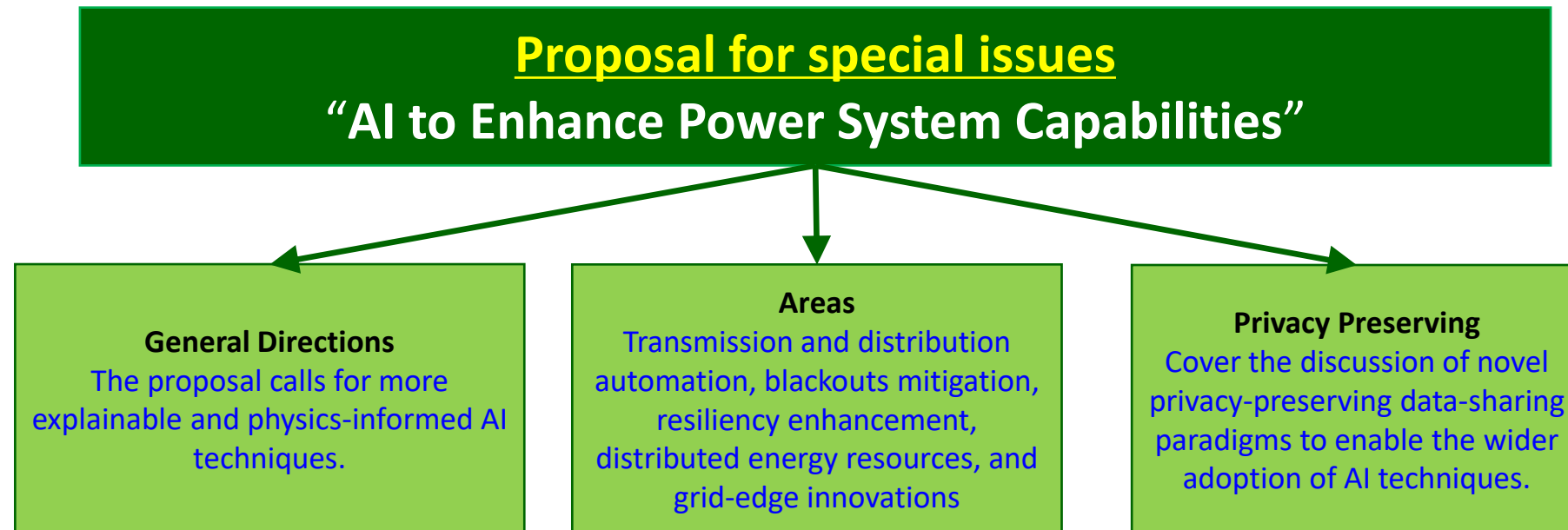
Blockchain for secure decentralized energy management of multi-energy system using state machine replication

Mingyu Yan, Fei Teng, Wei Gan, Wei Yao, Jinyu Wen
1 May 2023
Article 120863

Article preview

A Special Issue for Magazine

- Raised a special issue for IEEE P&E Magazine, titled '**AI to Enhance Power System Capabilities: Modelling, Operation, and Control.**'
- Proposed guest editors: Chongqing Kang, Tsinghua University, China; Ricardo Jorge Bessa, INESC TEC, Portugal; Yi Wang, The University of Hong Kong, China
- This issue will be published in **September/November 2023**



A Review Paper on Data Sharing



Acceptance by Advances in Applied Energy on 27 March 2023.

Data sharing in energy systems^{*}

Jianxiao Wang^{a,c,1}, Feng Gao^{b,1}, Yangze Zhou^d, Qinglai Guo^e, Chin-Woo Tan^f, Jie Song^{b,c}, Yi Wang^{d,*}

^a National Engineering Laboratory for Big Data Analysis and Applications, Peking University, Beijing, 100871, China
^b Department of Industrial Engineering and Management, College of Engineering, Peking University, Beijing, 100871, China
^c Changsha Institute for Computing and Digital Economy, Peking University, Changsha, China
^d Department of Electrical and Electronic Engineering, The University of Hong Kong, Hong Kong, China
^e Department of Electrical Engineering, Tsinghua University, Beijing, 100084, China
^f Department of Civil and Environmental Engineering, Stanford University, Stanford, CA 94305, USA

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Right confirmation
Smart grids

ABSTRACT

Big data has been advocated as a dominant driving force to unleash the great waves of the next-generation industrial revolution. While the ever-increasing proliferation of heterogeneous data contributes to a more sustainable energy system, considerable challenges remain for breaking down the barrier of data sharing across monopolistic sectors and fully exploiting data asset value in a trustworthy environment. Here, we focus on a global aspiration and interest regarding the challenges, techniques, and prospects of data sharing in energy systems. In this paper, a conceptual framework for data sharing is designed, in which we introduce the commodity attribute of data assets and explain the bottlenecks of data trading. Two critical issues, i.e., right confirmation and privacy protection, are then systematically reviewed, which provide a fundamental guarantee for credible data openness. A detailed data market is conceived by elaborating on market bids, data asset valuation and pricing strategy, and game-based clearing. Finally, we conduct a discussion about some low-hanging fruit of data sharing in energy systems.

1. Introduction

1.1. Motivation and background

With growing attention on the economic and strategic value of data sharing in improving the transformation of traditional industries, deep integration of multiple industries and social service management, and others, it has become a global trend to promote the integration, disclosure, and sharing of data in various industries [1,2]. To maximize the benefits of data sharing and reduce risks and harms such as privacy breaches, the 2021 Digital Economy Report released by the United Nations Conference on Trade and Development calls for a global data governance approach to facilitate the free flow of data across borders [3]. In December 2022, the Chinese government put forward the Opinions on Building a Data-Based System to Better Play the Role of Data, aiming at systematically building a data-based system to effectively remove institutional barriers that hinder the supply, circulation, and utilization of data. The global data market is growing rapidly and is expected to

exceed 22 billion dollars in 2024 [4]. However, with the development of the data market, the problems of data right confirmation, privacy protection, and pricing are increasingly prominent [5,6]. In 2022, the Health and Location Data Protection Act was proposed in the United States to prohibit data brokers from selling Americans' location and health data. In recent years, data asset pricing methods have emerged endlessly, but all of them are difficult to meet the needs of various industries because of their limitations [7].

Although data trading has been explored in many industries, it is very difficult to open and share data in the energy market due to the monopolistic nature of the energy industry [8,9]. There are four challenges to data sharing in the energy industry: (1) Large volume of data. Conventional energy dispatching automation system contains tremendous data sampling points, and the high sampling frequency makes the total volume of data reach petabyte (PB) level; (2) Complex data types. There are many kinds of equipment in the energy industry, and the monitoring data generated are complex and diverse; (3) Low data value density. A large amount of data in the energy systems are redundant

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^{*} Corresponding author.

^{*} E-mail address: yiwang@eee.hku.hk (Y. Wang).

¹ These authors contribute equally.

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We conduct a comprehensive literature review of data sharing in energy systems and design a conceptual framework for data sharing.

We review two enabling technologies that provide a fundamental guarantee for credible data openness, i.e., right confirmation and privacy protection.

A detailed data market is conceived by elaborating on comprehensive sectors from market bidding and clearing to settlement.

A Tutorial in CIRED

- Organized a tutorial **Data Sharing and Cybersecurity in Smart Grids** with CIRED

27th International Conference & Exhibition on
ELECTRICITY DISTRIBUTION



- Presenters of the tutorial

Jean-François Toubeau : jean-francois.toubeau@kuleuven.be



Jean-François Toubeau received the Master degree and the Ph.D. degree in electrical engineering from the University of Mons (Belgium) in 2013 and 2018, respectively. He is currently a Senior Researcher with the University of Leuven (KU Leuven) Energy Institute, TME Branch (energy conversion). His research interests include machine learning and decision-making in modern power systems.

Yi Wang : yiwang@eee.hku.hk



Yi Wang is currently an Assistant Professor with the Department of Electrical and Electronic Engineering, The University of Hong Kong, Hong Kong. Yi Wang received the B.S. degree from Huazhong University of Science and Technology, Wuhan, China, in June 2014, and the Ph.D. degree from Tsinghua University, Beijing, China, in January 2019. His research interests include data analytics in smart grids, energy forecasting, multienergy systems, Internet of Things, and cyber-physical-social energy systems.

Alysson Bessani: anbessani@ciencias.ulisboa.pt



Alysson Bessani is an Associate Professor of the University of Lisbon Faculty of Sciences, Portugal, and director of the LASIGE research unit. He received his Ph.D. in Electrical Engineering from UFSC (Brazil) in 2006, was a visiting professor at Carnegie Mellon University (2010) and a visiting researcher at Microsoft Research Cambridge (2014). Alysson coordinated/collaborated in ten international projects and co-authored more than 100 peer-reviewed publications on dependability, security, critical infrastructures protection, Byzantine fault tolerance, and cloud computing. He is also a co-founder of the Vawlt dependable & secure cloud storage startup (<https://vawlt.io>). More information about him can be found at <http://www.di.fc.ul.pt/~bessani>.

Tutorial 1 – Data Sharing & Cybersecurity in Smart Grids

Aim of the tutorial

The purpose of the tutorial is to present how do deal with privacy issues in smart distribution grids, regarding both data sharing in big data analytics and the cybersecurity aspects.

The first part of this tutorial will be dedicated on how to break the data barrier and promote data sharing. After giving a broad overview of new technologies for data sharing (blockchains, noise-injection techniques, etc.), efforts will be devoted to two aspects, i.e., i) privacy-preserving data analytical methods, and ii) data pricing or valuation approaches.

To that end, the relevant statistical methods and data-driven approaches in distribution systems will be introduced, along with recent advances in privacy-preserving settings (e.g., federated learning, differential privacy, etc.) to enable data sharing.

In complement, the data trading mechanisms and data value quantification methods in power and energy industries will be summarized and compared.

The second part of the tutorial is focused on the discussion of cybersecurity issues and techniques related to SCADA networks, intrusion detection, and the security of end and legacy devices. The objective is not only to understand the critical risks and technologies used today, but also to foresee innovations that can improve the cybersecurity and resilience of smart distribution networks of the future.

Speakers

- Alysson Bessani** (University of Lisbon, Portugal)
- Jean-François Toubeau** (KULeuven, Belgium)
- Yi Wang** (University of Hong Kong, Hong Kong)

Plans for Activities of Next Stage

- Technical report preparation covering:
 - data sharing use cases in energy systems.
 - on-going activities like data spaces and industry practices
- Find potential data set for data sharing to enrich the 'big data access working group' website



The screenshot shows the homepage of the Big Data Access Working Group website. The main heading is "Big Data Access Working Group" with the subtitle "IEEE PES SUBCOMMITTEE ON BIG DATA & ANALYTICS FOR POWER SYSTEM". A navigation menu includes links for HOME, ABOUT US, DATA SETS, SEARCH DATA, CONTRIBUTE DATA, ACTIVITIES, RESOURCES, and CONTACT US. The central banner features the text "Working Group on Access to BIG DATA" and "IEEE PES Subcommittee on Big Data & Analytics for Power System". Below the banner is a "Home" section with "Objectives" and "Announcements". The "Objectives" section states the goal of facilitating public access to power systems data. The "Announcements" section lists recent activities, including a draft white paper and panel sessions. On the right side, there is a search bar, "QUICK LINKS" to data sets and the subcommittee, a "JOIN OUR MAILING LIST" form, a "SUBSCRIBE" button, and "SPONSORS" including IEEE PES and IEEE.

Thank you for your attention



Officers:

Yi Wang (Chair), yiwang@eee.hku.hk

Ricardo Bessa (Vice-Chair), ricardo.j.bessa@inesctec.pt

Website:

<http://www.eeyiwang.com/TFDS.html>