Editorial: Rising stars in energy research: 2022

Yang Li[1]*, Ningyi Dai[2], Wilfried G. J. H. M. Van Sark[3],
Mohammadreza Aghaei[4,5], Giovanni Malara[6],
João C. C. Henriques[7], Zhengshun Cheng[8],
Andreas Borgschulte[9], Rahul R. Bhosale[10], Pejman Kazempoor[11],
Prodip K. Das[12] and John S. Hardy[13]

[1]School of Electrical Engineering, Northeast Electric Power University, Jilin, China, [2]State Key Laboratory of Internet of Things for Smart City, Department of Electrical and Computer Engineering, University of Macau, Macao, China, [3]Copernicus Institute of Sustainable Development, Utrecht University, Utrecht, Netherlands, [4]Department of Ocean Operations and Civil Engineering, Norwegian University of Science and Technology (NTNU), Alesund, Norway, [5]Department of Sustainable Systems Engineering (INATECH), University of Freiburg, Freiburg, Germany, [6]Natural Ocean Engineering Laboratory (NOEL), Mediterranea University of Reggio Calabria, Reggio Calabria, Italy, [7]IDMEC, Instituto Superior Técnico, Universidade de Lisboa, Lisboa, Portugal, [8]State Key Laboratory of Ocean Engineering, Shanghai Jiao Tong University (SJTU), Shanghai, China, [9]Laboratory for Magnetic and Functional Thin Films, Empa—Swiss Federal Laboratories for Material Science and Technology, Dübendorf, Switzerland, [10]Department of Chemical Engineering, University of Tennessee at Chattanooga, Chattanooga, TN, United States, [11]School of Aerospace and Mechanical Engineering, University of Oklahoma, Norman, OK, United States, [12]School of Engineering, University of Edinburgh, Edinburgh, United Kingdom, [13]Pacific Northwest National Laboratory, Richland, WA, United States

Editorial on the Research Topic
Rising stars in energy research: 2022

1 Introduction

As the demand for sustainable and efficient energy solutions continues to grow, researchers worldwide are making significant strides in various domains of energy research. Recognising the future leaders of Energy Research is fundamental to safeguarding tomorrow's driving force in innovation.

This Research Topic aims to provide a comprehensive overview of recent advancements in energy-related studies across multiple disciplines. At present, 9 papers have been accepted for this Research Topic, which will be delved into the realms of ocean energy and conversion, power systems and controls, fuel cells and catalysts, solar energy and building energy utilization, and high-temperature electrochemical cells. By highlighting the key findings and innovations presented in a Research Topic of seven diverse articles, we aim to foster a deeper understanding of the current state of energy research and its potential implications for a sustainable future.

2 Ocean energy and conversion

Diaz-Maya et al. explore the assessment of wave energy converters in the Gulf of Mexico using a multi-criteria approach. The study investigates the spatial distribution of wave power, seasonal variability, and identifies the most viable technology for harnessing wave energy in the region.

3 Power systems and controls

The articles in this section focus on controlling cascading failures in power systems through a non-scheduled multi-stage decision-making approach. By establishing a model that accounts for the entire process of cascading failures, researchers demonstrate the efficacy of their proposed method in minimizing outage probabilities and enhancing system reliability. Liu et al. propose a machine learning-based algorithm for optimal power dispatch in microgrids, showcasing improved energy management and cost savings. Song et al. focus on adaptive control strategies for grid-connected photovoltaic systems, aiming to optimize system performance under varying conditions.

4 Fuel cells and catalysts

Herradon et al. present a novel approach to enhance the performance of fuel cells by designing advanced catalyst materials with improved activity and stability. García-Salaberri et al. explore the integration of solar energy and building energy utilization through the development of smart energy management systems, enabling efficient energy consumption and reduced environmental impact.

5 Solar energy and building energy utilization

Manni et al. explore solar energy digitalization in high latitudes, presenting a model chain that combines solar irradiation models, Light Detection and Ranging (LiDAR) scanners, and high-detail 3D building models. Their research highlights the potential of solar mapping in urban areas and the accurate estimation of solar irradiation on different surfaces, including roofs and façades. Graniero et al. strive to harness the potential of machine learning to advance the stability of perovskite solar cells. Through extensive analysis of data from the Perovskite Database Project, their study reveals the crucial role of data quality, the limitations of increasing data quantity, and the necessity for universal stability metrics to drive progress in this promising technology. Razo et al. introduce a genetic algorithm-based approach for precise power now-casting and digital twinning of small and medium-scale PV systems using exclusively on-site measured data. Their algorithm achieves exceptional accuracy in power predictions while providing valuable insights into system configuration, enabling efficient operation and effective management of PV assets in the renewable energy market.

6 High-temperature electrochemical cells

Cammarata et al. delve into the theoretical analysis of mixed open-circuit potential for high-temperature electrochemical cell electrodes. By employing analytical equations based on mixed potential theory, researchers provide insights into the calculation of theoretical open circuit voltage (OCV), particularly in the case of co-oxidation and co-reduction reactions in solid oxide cells.

7 Conclusion

The nine articles presented in this Research Topic cover a wide range of topics in energy research, demonstrating the diversity and depth of ongoing studies in the field. From ocean energy assessment to power system controls, fuel cell optimization, solar energy utilization, and high-temperature electrochemical cells, researchers are pushing the boundaries of knowledge and innovation. These findings pave the way for sustainable energy solutions and offer valuable insights for future research and development.

As we continue to strive for a greener and more sustainable future, it is imperative to recognize the collective efforts of researchers worldwide who are working tirelessly to advance the field of energy. We hope that this editorial provides a glimpse into the exciting progress being made and inspires further exploration in these crucial areas.

Author contributions

All authors listed have made a substantial, direct and intellectual contribution to the work, and approved it for publication.

Funding

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

The handling editor declared a past collaboration with the author ND.

Publisher's note