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Editorial: Advances in process modeling and optimization of clean energy processes

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Editorial on the Research Topic
Advances in process modeling and optimization of clean energy processes

Clean energy processes are a panacea to mitigating the adverse effect of greenhouse gas emissions from the combustion of fossil fuel. Attaining the target of net-zero carbon emission in 2050 is largely dependent on the availability and affordability of clean energy processes which are renewable. Since the clean energy processes to a large extent depend heavily on several variables, such as the weather, the technology being utilized, and the materials being employed, modeling and optimization could help to minimize this inherent sophistication thereby enhancing the availability and affordability. Due to the strategic importance of clean energy processes in actualizing net-zero emissions by 2050, this subject set was designed to explore expert contributions on breakthroughs, improvements, and advances in the modeling and optimization of clean energy processes.

The modeling of bio-hydrogen recovery from agro-industrial wastewater was reported by Hossain et al. The authors employed data-driven machine learning algorithms to model biohydrogen production from dairy, chicken processing, and palm oil mills. The production of biohydrogen from different wastewaters may be adjusted in real-time with the aid of machine learning algorithms, increasing process effectiveness and effective usage of resources like energy and materials. The historical data from the processes may be used to optimize intended products and constantly enhance process performance. Natural gas as a clean energy source has been anticipated to play a vital role in transitioning to net-zero emissions by 2050. With increasingly rigorous environmental regulations, liquified natural gas (LNG) is seen as a possible alternative fuel for the maritime sector, although the safety issues brought on by LNG leakage incidents need to be taken into consideration and studied. Wang et al. employed computational fluid dynamics to simulate cryogenic safety analysis in an LNG-powered ship during leakage. When LNG leaked, the range of the cryogenic area in the fuel gas preparation room was correlated with the direction of the flow field. Traditional energy sources not only have finite supplies but also release harmful byproducts into the environment. One of the most stimulating eco-friendly energy sources is the photovoltaic (PV) Solar System. Srivastava et al. evaluated a grid-connected solar-powered microgrid in northern India using PV*Syst software. Rooftop solar panels are a technologically and

economically viable way to provide power in northern India, as shown by the comparative analysis. Vennila et al. reported static and dynamic mixed economic and emission dispatch problem that was solved using the tournament selection-based ALO algorithm. According to the findings, the production of clean energy can be stabilized in the future by combining a hybrid dynamic economic and emission dispatch model with thermal power plants, wind turbines, solar panels, and energy storage devices to achieve a balance between operating costs and pollutant emissions. Prakash et al. presented a review of battery energy storage technologies for supplementary services in distribution grids. The review analysis includes a cost-benefit analysis and a list of energy storage laws as well as battery energy storage initiatives from across the world. Future Research Topics are also discussed, along with recommendations on how to overcome the implementation issues that come with integrating battery energy storage systems in distribution grids. The interest in modeling and optimization of clean energy processes is evidenced by the subject set's cumulative view count, which at the time of writing this editorial had reached 4746. There had also been 524 downloads of the different articles.

Author contributions

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

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.

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