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# Editorial: Women in science: energy research 2023

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Editorial on the Research Topic
Women in science: energy research 2023

Women constitute 32% of global employment in the energy sector. Unsupportive environments, social biases, and lack of role models are some of the factors deterring females from pursuing careers in science, technology, engineering, and mathematics (STEM). Gender equality is necessary for sustainable growth and representation in the STEM field and can only be achieved through active effort to change outdated mindsets and defeat harmful stereotypes.

This Research Topic invited contributions to highlight, showcase, and celebrate the work of female researchers across all fields of Energy Research. The work presented here highlights the diversity of research performed across the entire breadth of Wind and Ocean Energy research and presents advances in theory, experiment, and methodology with applications to compelling problems.

After rigorous review, 5 high-quality articles contributed by 25 authors were finally accepted for their contributions to the Research Topic.

In the paper *Challenge and strategy for the successful application of CCUS-EOR in China*, Kang et al. explore the opportunities for carbon capture, utilization and storage for enhanced oil recovery (CCUS-EOR) in China. Challenges include lack of clarity in the specific development scheme of CCUS-EOR, cost, and technical constraints. Suggested strategies include state cooperation to clarify responsibilities and obligations of different industries and enterprises around carbon emission reduction targets; improvement of economic policies, such as tax, credit, land, carbon market trading, environmental protection, project approval, etc., as well as storage, monitoring and carbon trading standards; and the implementation cost of the CCUS-EOR project should be reduced by strengthening technology research and development.

In the paper, *Reduced order modeling of non-linear monopile dynamics via an AE-LSTM scheme*, Simpson et al. demonstrate the application of a recently developed reduced order modelling (ROM) methodology to approach soil structural analysis in offshore wind turbine structures. The ROM is trained to emulate a steel monopile foundation constrained by non-linear soil and is subjected to forces and moments at the top of the foundation, which represents the equivalent loading of an operating turbine under wind and wave forces. The ROM approximates the time domain and frequency domain over a range of different wind and wave loading regimes, while reducing the computational toll by a factor of 300.

In the paper *Engineering exsolved catalysts for $CO_2$ conversion*, Ali et al. develop a methodology to design catalysts that can reduce $CO_2$ more efficiently and with lower loading of noble metals. A small amount of a transition metal (Ni) was introduced to an exsolved noble metal system (Rh-containing perovskite). The p-RhNi perovskites demonstrated significantly improved catalytic activity in the dry reforming of methane reaction compared with its p-Rh counterpart.

In the paper, *Linking geological and infrastructural requirements for large-scale underground hydrogen storage in Germany*, Alms et al. explore the safety considerations and storage capacities of pore storage systems in underground natural gas storage systems and saline aquifers. Safety considerations include biotic and abiotic reactions of hydrogen with microorganisms or mineral components in the reservoirs; the petrophysical properties of prospective pore storage systems; storage depth, sealing capacity, and integrity of caprock; cushion gas requirements; hydrogen solubility; and thermophysical parameters of hydrogen at underground storage conditions. Estimated hydrogen storage capacity in underground natural gas storage is up to 8 billion $m^3$ (0.72 Mt at STP), corresponding to 29 TWh of energy equivalent of hydrogen. Saline aquifers may offer additional storage capacities of 81.6 Mt to 691.8 Mt, which amounts to 3.2 PWh to 27.3 PWh of energy equivalent of hydrogen.

In the paper *The permanently rotating wind turbines: a new strategy for reliable power system frequency support under low and no wind conditions*, Džodić and Đurišić explore the technical feasibility and benefits of a new concept of wind turbine operation that enables the permanent rotation of the wind turbine under low and no wind conditions. This would allow wind turbines to continuously offer frequency support. In a case study performed for the South Banat region in Serbia to demonstrate the concept using a dynamic simulation to illustrate the permanent operation strategy's impact in a low-inertia system under low and no wind conditions, it was found that, not only was there continuous capability for virtual inertia, but there was reduced wear of the wind turbine mechanical components due to a lower number of on/off events.

It is clear that the authors of these articles, who are women in science energy research, are carrying out cutting edge energy research with a focus on solving problems of sustainability, efficiency, clean energy access, and energy storage. The research in this Research Topic will advance adaptation and mitigation of the impacts of climate change.

Finally, the guest editors would like to extend their gratitude to all the authors for their insightful contributions, as well as to all the reviewers for their tremendous work on the reviews. We especially want to thank the journal's editor-in-chief and the editorial board for their outstanding support of this Research Topic.

## Author contributions

MR: Writing–original draft. YV: Writing–review and editing. SW: Writing–review and editing.

## 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 author(s) declared that they were an editorial board member of Frontiers, at the time of submission. This had no impact on the peer review process and the final decision

## Publisher's note