Special Issue

Underground Energy Storage for Renewable Energy Sources

Message from the Guest Editors

The rapid development of renewable energy is reshaping global energy systems, while amplifying the challenge of balancing fluctuating supply and demand across different timescales. Underground energy storage (UES) offers a diverse set of solutions by utilizing geological formations to store energy in various forms, including gases, heat, and mechanical energy. Compared with surface-based storage, UES provides large capacity, long-term stability, and opportunities for integration across multiple energy carriers. Technologies such as hydrogen storage, natural gas storage, thermal storage, compressed air storage, and pumped hydroelectric storage can be applied individually or in combination, offering flexible pathways to support renewable integration, enhance system reliability, and reduce greenhouse gas emissions. Coupling UES with CO2 geological utilization and sequestration delivers additional environmental benefits... This Issue welcomes original research, comprehensive reviews, and case-based studies that address fundamental processes, advanced modeling and experimental methods, and practical applications in underground energy storage for renewable energy systems.

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Message from the Editor-in-Chief

As the world of science becomes ever more specialized, researchers may lose themselves in the deep forest of the ever increasing number of subfields being created. This open access journal *Applied Sciences* has been started to link these subfields, so researchers can cut through the forest and see the surrounding, or quite distant fields and subfields to help develop his/her own research even further with the aid of this multi-dimensional network.

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