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Analysis of hybrid energy storage systems using post-mining infrastructure, including day-ahead market (DAM) and system operating cycle characteristics.

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The development of a new energy storage system requires an analysis of its integration with the centralised energy system. Energy production and consumption should be integrated with the day-ahead market (DAM) to optimise the cost of energy conversion. This work presents the results of an analysis of a hybrid energy storage system that uses post-mining infrastructure. The analysis took into account the day-ahead market (DAM) and the operating cycles of a pumped storage hydroelectric power station (PSH). Three types of energy storage system were analysed: CO₂ compression, air compression and traditional PSH. The optimal configuration in terms of unit profit (298 PLN/MWh) was obtained for the middle-level storage capacity system (42 MWh) in the case of the CO₂ system. Project “Hybrid energy storage system using post-mining infrastructure (HESS)” supported by Research Fund for Coal and Steel. No. 101112380 (RFCS-2022).