

Balancing-oriented hydropower operation makes the clean energy transition more affordable and boost

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Reservoir hydropower offers a compelling combination of stability and flexibility services for modern water and power grids. However, its operating flexibility is poorly characterized in energy system planning, missing opportunities to cost-effectively uptake variable renewable energy (VRE) for a clean energy transition. In this study, a research team from the National University of Singapore has developed a fully coupled reservoir operation and energy expansion model to quantify the economic and environmental benefits attained from adaptive hydropower operation in a high VRE future. Their case study of the China Southern Power Grid reveals that, in a 2050 net-zero grid, simply adapting hydropower operations to balance VRE can reduce 2018-2050 total system costs by 7% (that is, US\$28.2 billion) and simultaneously save 123.8‰km³ of water each year (that is, more than three times the reservoir capacity of the Three Gorges Dam). These vast, yet overlooked, cost- and water-saving potentials highlight the importance of incorporating balancing-oriented hydropower operation into future pathways to jointly decarbonize and secure power and water grids.

Balancing-oriented hydropower operation makes the clean energy transition more affordable and simultaneously boosts water securityÂ - Zhanwei Liu & Xiaogang He

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