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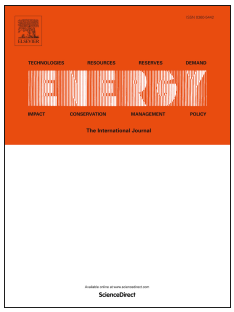

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Assessing small hydro/solar power complementarity in ungauged mountainous areas: a crash test study for hydrological prediction methods

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Abstract

In many regions, the integration of small hydropower with solar/wind energy is examined as a way to meet renewable energy targets. A good understanding of the potential for this integration in the typically poorly gauged catchments is important. We examine the skill of different hydrological prediction methods to predict complementarity between run-of-the river hydropower and solar power in data sparse mountain basins of the Eastern Italian Alps. Two kinds of prediction methods are used: a semi-distributed, conceptual hydrological model, and an index method based on the drainage area ratio. In the case of the hydrological model, we analyse the efficiency of the method when the model parameters cannot be calibrated but must be transposed from a donor catchment where calibration data are available. The complementarity between the two energy sources is examined using the standard deviation of the energy balance as a proxy of the balancing system costs and it is evaluated over different temporal aggregation scales. Results show that the performance depends on the temporal scale and outlines the impact of small phase errors in hydrological prediction. In general terms, the index method performs better for snowmelt dominated catchments while the hydrological model performs better for rain-fed catchments.