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Electric truck hydropower, a flexible solution to hydropower in mountainous regions

Julian Hunt

International Institute of Applied Systems Analysis (IIASA), Austria

hunt@iiasa.ac.at

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Abstract

The world is undergoing a transition to a more sustainable energy sector dominated by renewable sources of energy. Climate change will increase the unpredictability of the weather, which calls for an increased resiliency of the future energy systems. This paper proposes an innovative solution that consists of catching water from streams at high altitudes to fill storage containers and transport them down a mountain, converting the potential energy of water into electricity and storing it in the truck's battery. The energy stored in the electric truck can be sold to the grid or used by the truck to transport other goods. Results show that the levelised cost of the electricity truck hydropower (ETH) is 30-100 USD/MWh, which is cheap when compared with conventional hydropower 50-200 USD/MWh. The electricity generation world potential for the technology is estimated to be 1.2 PWh per year, which is equivalent to around 4% of the global energy consumption in 2019. Apart from being a low cost and impact electricity generation technology, electric truck hydropower can operate in combination with solar and wind resources and provide energy storage services to the grid.

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Biography

Julian Hunt is a research scholar in the Sustainable Service Systems (S3) Research Group of the IIASA Energy, Climate, and Environment Program where he focuses on implementing daily and seasonal storage energy technologies in MESSAGE models and analyzing the impact of these technologies on long-term energy planning. His research interests include analysis of energy systems, water-energy-land interfaces, climate change risks, energy security, and energy storage. Hunt holds a D.Phil in Engineering Science from the University of Oxford and a B.Eng degree in Chemical Engineering from the University of Nottingham.

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