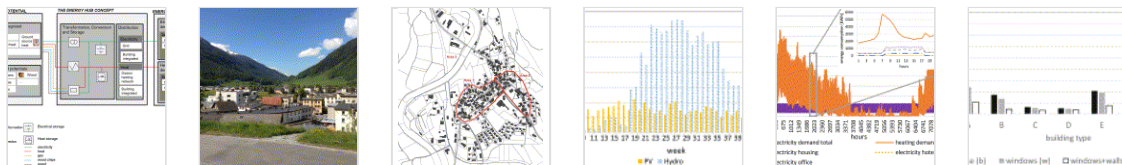


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Towards an energy sustainable community: An energy system analysis for a village in Switzerland

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Highlights

- A future energy system analysis for a village using the energy hub approach.
- Integration of distributed energy systems requires retrofitting of building stock.
- Results show that an energy sustainability of 83% can be achieved for the village.
- 86% of CO₂-emissions can be reduced, if distributed energy systems are integrated.

Abstract

This paper aims to integrate decentralized energy systems in a village in Switzerland, which has the goal to phase out fossil fuels and rely on local renewable energy sources. To reach this ambitious target, a revision of the current energy system is required together with retrofitting of the building stock. The method applied is based on the energy hub concept, which can be used to optimize the energy consumption during planning and operation. To apply the energy hub concept at neighbourhood level, a three step approach is required, including modelling the energy demand of the buildings, the evaluation of the local renewable potential, and the management and optimization of demand and supply. Centralized and decentralized local renewable sources are investigated, namely photovoltaics, biomass, or small hydro power. Scenarios are evaluated based on their environmental performance and savings of CO₂ emissions. Results show that an energy sustainability (ratio of energy demand covered by renewables) of 83% and a CO₂ emissions reduction of 86% can be achieved. The results

further suggest that up to 50% of the available energy potential from renewables cannot be utilized in this community when insufficient storage is provided in the energy system.

Keywords

Energy hub; Renewables; Energy scenarios; Urban energy system; Neighbourhood

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