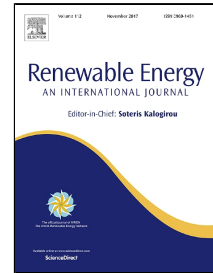


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Rural electrification and capacity expansion with an integrated modeling approach

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## Title: Rural electrification and capacity expansion with an integrated modeling approach

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30 **Abstract:** In developing countries, mini-grids are seen as an important option to improve electrification rates in rural areas. In order to be successful, mini-grids face issues of operation and sizing of generation capacities. Current studies on the optimal sizing of mini-grids do not include capacity expansion feedbacks regarding the operator's or investor's long-term economic performance on growth in electricity usage, e.g. gap between demand and supply  
35 impacting the operator's income. Using a System Dynamics model, this paper compares the impact from two capacity expansion strategies on rural mini-grid operator's long-term economic performance. The two capacity expansion strategies are: a strategy with minimized costs and a strategy where only diesel power is allowed. Research shows that a cost-  
40 minimized capacity expansion strategy might not be the most beneficial solution for the operator's long term financial performance. Specifically, the high investment costs prohibit the implementation of the cost-minimized expansion strategy. In addition, the diesel-only expansion strategy suffers from high operational costs, which creates long-term challenges as

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