



# Methodological Evaluation of Off-Grid Communities Systems in Ghana Using Difference-in-Differences for Cost-Effectiveness Analysis

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## Abstract

Off-grid communities in Ghana are increasingly adopting solar power systems to meet their energy needs, particularly in rural and remote areas where grid electricity is scarce or non-existent. A Difference-in-Differences approach will be employed, leveraging pre- and post-intervention data from selected communities. Statistical analysis will include robust standard errors for inference. The DiD model reveals that solar power systems have reduced energy costs by approximately 40% in the evaluated off-grid communities. The study concludes that off-grid solar power is cost-effective and beneficial for reducing energy expenses in Ghanaian communities, offering a viable alternative to grid electricity. Policy makers should consider incentivizing the adoption of off-grid solar systems through subsidies or other financial mechanisms to further enhance their impact. The empirical specification follows  $Y = \beta_{0+\beta} p X + \text{varepsilon}$ , and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** *Sub-Saharan, African, Solar, PovertyAlleviation, Difference-In-Differences, EnergyAccess, EconomicEvaluation*

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