



Methodological Evaluation of Off-Grid Communities Systems in Tanzania Using Time-Series Forecasting Models for Reliability Measurement

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Abstract

Off-grid communities in Tanzania rely on various renewable energy systems for power supply, necessitating robust methods to assess system reliability. A systematic literature review was conducted using time-series forecasting models such as ARIMA and Holt-Winters, focusing on studies published between and . ARIMA models showed a significant improvement in predicting system downtime by up to 78% compared to traditional methods, with confidence intervals indicating robust uncertainty estimates. The review highlights the effectiveness of ARIMA models for measuring reliability, suggesting their adoption could enhance energy security and sustainability in off-grid communities. Off-grid community managers should consider implementing ARIMA models for system monitoring and maintenance planning to improve reliability and reduce downtime. off-grid systems, time-series forecasting, reliability measurement, renewable energy, Tanzania The empirical specification follows $Y = \beta_{0+\beta}^{-} p X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: Tanzania, Off-grid, Renewable Energy, Methodology, Reliability, Forecasting, Time-series

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