



# Methodological Assessment of Off-Grid Communities Systems in Ethiopia Using Time-Series Forecasting Models for Efficiency Measurement

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## Abstract

Off-grid communities in Ethiopia rely on various renewable energy sources for power supply, but their efficiency and performance vary widely. The study employs ARIMA (AutoRegressive Integrated Moving Average) model for forecasting energy consumption patterns and evaluating system efficiency. The ARIMA model provides a robust framework for monitoring and enhancing the operational performance of off-grid renewable energy systems in Ethiopia. Implementing proactive maintenance schedules and optimising system configurations based on forecasted demand can improve overall efficiency. The empirical specification follows  $Y = \beta_{0+\beta} p X + \text{varepsilon}$ , and inference is reported with uncertainty-aware statistical criteria.

**Keywords:** *Ethiopia, Geographically Dispersed, Renewable Energy, Time-Series Analysis, Forecasting Models, Efficiency Measurement, Methodology*

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