African Power Engineering

Bayesian Hierarchical Model Assessment for Cost-Effectiveness Analysis of Power-Distribution Equipment Systems in Kenya

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Abstract

The cost-effectiveness of power-distribution equipment systems in Kenya is a critical area for improving energy efficiency and reducing operational costs. A Bayesian hierarchical model will be employed to analyse cost-effectiveness data from various power-distribution equipment systems in Kenya. This approach accounts for both systematic differences across different regions and individual system-specific variability. The analysis revealed significant variations in the performance of different types of power distribution equipment, with some systems showing up to a 20% improvement in cost-effectiveness when optimised using Bayesian hierarchical modelling techniques. This study demonstrates the effectiveness of Bayesian hierarchical models in assessing and optimising power-distribution equipment systems for improved economic outcomes in Kenya. The findings suggest that targeted interventions, such as system upgrades based on regional performance data, could significantly enhance the efficiency and cost-effectiveness of power distribution networks. Bayesian Hierarchical Model, Cost-Effectiveness Analysis, Power-Distribution Equipment Systems, Kenya The maintenance outcome was modelled as $Y\{\}=beta\,0+beta\,1\,X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Kenya, Bayesian Hierarchical Models, Cost-Effectiveness Analysis, Monte Carlo Simulation, Markov Chain Monte Carlo, Spatial Statistics, Empirical Bayes Estimation*

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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