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Methodological Evaluation of Power-Distribution Equipment Systems in Ethiopia Using Quasi-Experimental Design for System Reliability Analysis

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Abstract

This study focuses on evaluating power-distribution equipment systems in Ethiopia, aiming to enhance system reliability through methodological evaluation. A quasi-experimental design was employed, including data collection from multiple sites across Ethiopia. Statistical analysis utilised regression models to identify significant predictors of system reliability. The model identified a critical component failure rate of 5% as the primary cause of system downtime, suggesting that addressing this could significantly improve overall system performance. Quasi-experimental design proved effective in measuring system reliability and identifying key areas for improvement. Recommendations include targeted maintenance schedules and upgraded infrastructure components. Implement a comprehensive maintenance programme focusing on the identified critical component failure rate, and upgrade power distribution systems to enhance overall reliability. The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Ethiopia, Power Distribution Systems, Quasi-Experimental Design, System Reliability, Methodology, Engineering Metrics, Network Analysis*

ABSTRACT-ONLY PUBLICATION

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