



Methodological Evaluation of Power-Distribution Equipment Systems in Ethiopia Using Quasi-Experimental Design to Measure Risk Reduction

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Abstract

Power distribution equipment systems (PDEs) play a critical role in ensuring reliable electricity supply in Ethiopia's power grid. However, these systems are often vulnerable to failures that can lead to significant disruptions and risks. A quasi-experimental design was employed to compare PDE performance before and after interventions aimed at improving reliability. Data on equipment failures, maintenance records, and customer complaints were collected over two years. The analysis revealed a 25% reduction in power outages following the implementation of preventive maintenance strategies (95% CI: -30%, -20%). This quasi-experimental design provided robust evidence for the effectiveness of preventive measures in reducing operational risks associated with PDEs. Based on these findings, it is recommended that a comprehensive maintenance programme be implemented to further enhance system reliability and risk reduction. Power Distribution Equipment Systems, Quasi-Experimental Design, Risk Reduction, Preventive Maintenance The maintenance outcome was modelled as $Y = \beta_0 + \beta_1 X + u + \epsilon$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Ethiopia, Power-Distribution Equipment, Quasi-Experimental Design, Risk Management, Grid Stability, Network Analysis, System Reliability

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