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Methodological Evaluation of Power-Distribution Equipment Systems in Uganda: Quasi-Experimental Design for Risk Reduction

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Abstract

Power distribution equipment (PDEs) play a critical role in urban electrification in developing countries like Uganda. However, inadequate PDE systems can lead to frequent failures and outages, increasing risks for both users and service providers. A mixed-methods approach combining surveys, technical audits, and interviews was employed. Data were analysed using logistic regression models for assessing the impact of PDE system integrity on user reliability. In our sample, 45% of reported outages correlated with defects in power distribution equipment, indicating a significant risk reduction potential through targeted maintenance and upgrades. The quasi-experimental design demonstrated promising results in measuring the impact of PDE system integrity on user reliability. Future studies should expand this approach to other urban areas. Ugandan authorities are recommended to implement regular inspection protocols for power distribution equipment, supported by targeted funding and technical training for maintenance personnel. Power Distribution Equipment, Quasi-Experimental Design, Risk Reduction, Urban Electrification The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *African geography, power distribution systems, quasi-experimental design, risk assessment, engineering evaluation, methodological analysis, urban electrification*

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