



Methodological Evaluation of Power-Distribution Equipment Systems in Nigerian Infrastructure: A Randomized Field Trial for Risk Reduction Assessment

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Abstract

Power distribution equipment systems in Nigerian infrastructure are critical for ensuring reliable power supply to various sectors including residential, commercial, and industrial applications. A randomized field trial was conducted in selected urban areas to assess the performance of various power distribution equipment configurations. Data were collected on system reliability, maintenance costs, and overall efficiency over a period of six months. During the trial, a 15% reduction in electricity outage duration was observed when using advanced surge protection devices compared to traditional circuit breakers, indicating significant potential for risk reduction. The randomized field trial demonstrated that the use of advanced surge protection devices can effectively reduce power distribution system risks by improving reliability and lowering maintenance costs. Infrastructure managers should consider implementing advanced surge protection devices in their systems to enhance operational safety and efficiency, thereby reducing the risk of costly failures and outages. Power Distribution Systems, Risk Reduction, Randomized Field Trial, Surge Protection Devices The maintenance outcome was modelled as $Y_i = \beta_0 + \beta_1 X_i + u_i + \epsilon_i$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Nigerian, Geographic Information Systems, Monte Carlo Simulation, Bayesian Networks, System Dynamics, Empirical Modelling, Risk Assessment*

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