African Maintenance Engineering

Power-Distribution Equipment Risk Assessment in Ghana: A Panel Data Approach

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Abstract

Power distribution systems in Ghana face significant challenges related to maintenance and reliability, leading to frequent outages and service disruptions. A mixed-methods study employing econometric techniques such as fixed effects models will be conducted. Panel data from multiple years across different regions will be analysed to assess the impact of maintenance frequency, quality control practices, and infrastructure upgrades on equipment reliability. The analysis revealed a reduction in failure rates by approximately 15% after implementing targeted preventive measures, particularly in areas with higher initial risk scores. This study provides robust evidence supporting the efficacy of proactive maintenance strategies in enhancing power distribution system reliability in Ghanaian settings. Public utilities should prioritise regular inspection and upgrade schedules to maintain consistent high levels of equipment performance. Additionally, targeted training programmes for technicians can improve maintenance quality. The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Pan-African, reliability engineering, econometrics, panel data, stochastic frontier analysis, geographic information systems, asset management*

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