



Methodological Assessment of Power-Distribution Equipment Systems in Ethiopia Using Quasi-Experimental Design to Evaluate System Reliability

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Abstract

Power distribution equipment systems are critical for ensuring reliable electricity supply in Ethiopia's rural areas. A quasi-experimental design was employed to assess system performance, with data collected on 120 randomly selected power stations across Ethiopia's regions. The analysis revealed that 65% of the equipment systems operated within their expected parameters, suggesting a need for targeted maintenance in high-risk areas. Despite initial challenges, the quasi-experimental design demonstrated its effectiveness in measuring system reliability and provided actionable insights for future improvements. Immediate attention should be given to enhancing maintenance protocols in regions with lower equipment performance metrics. 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: Ethiopia, Power Distribution, Quasi-Experimental Design, Methodology, Reliability Analysis, GIS, Evaluation Techniques

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