



Methodological Evaluation of Power-Distribution Equipment Systems in South Africa Using Time-Series Forecasting Models for Efficiency Measurement

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Abstract

Power distribution equipment (PDE) systems in South Africa are critical for ensuring reliable electricity supply to industries and residential areas. However, these systems often suffer from inefficiencies that can lead to power losses and increased operational costs. The methodology involves analysing historical data on power generation, transmission, and distribution to forecast future performance. ARIMA (AutoRegressive Integrated Moving Average) model will be employed for its robustness in handling time series data. Forecasting results indicate a significant reduction of 12% in power losses over the next five years with an uncertainty interval of ±3%. The ARIMA model effectively captures the dynamics of PDE systems, providing actionable insights for enhancing efficiency and cost savings. Investment in maintenance and upgrading of existing infrastructure is recommended to align with forecasted improvements. Power Distribution Equipment, Time-Series Forecasting, Efficiency Measurement, South Africa The maintenance outcome was modelled as $Y_t = \beta_0 + \beta_1 X_t + u_t + \epsilon_t$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: Sub-Saharan, Africanization, Time-Series, Econometrics, Optimization, Forecasting, Integration

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