

# A Quasi-Experimental Evaluation of Efficiency Gains in Kenya's Power-Distribution Equipment Systems

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## ABSTRACT

**Background:** Power-distribution systems in many developing nations face chronic inefficiencies, leading to substantial technical and commercial losses. There is a pressing need for robust, field-based methodologies to quantify the impact of equipment upgrades and interventions within these networks.

**Purpose and objectives:** This study aimed to develop and apply a quasi-experimental design to rigorously evaluate the efficiency gains attributable to the deployment of modern power-distribution equipment, specifically smart transformers and composite conductors, within a national utility's network.

**Keywords:** *Power distribution, Kenya, Quasi-experimental design, Efficiency gains, Sub-Saharan Africa, Technical losses*

### Article Highlights

- Difference-in-differences framework applied to real-world utility feeder data.
- Statistically significant 4.7 pp reduction in technical losses attributed to intervention.
- Method provides a credible model for evaluating capital projects in complex networks.
- Findings support regulatory shifts toward evidence-based investment incentives.

### Methodological Note

The study employs a difference-in-differences model with clustered standard errors to establish causal inference from a non-randomised equipment upgrade programme.

*This analysis offers a template for rigorous impact evaluation of infrastructure investments.*

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