

Quasi-Experimental Evaluation of Cost-Effectiveness in Rwanda's Power-Distribution Equipment Systems

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ABSTRACT

Background: Power-distribution systems in many developing nations face significant challenges in balancing infrastructure investment with long-term operational efficiency. There is a notable scarcity of rigorous, field-based evaluations of the cost-effectiveness of different equipment strategies within these constrained contexts.

Purpose and objectives: This study aimed to develop and apply a quasi-experimental methodology to empirically evaluate the comparative cost-effectiveness of alternative power-distribution equipment systems deployed within a national utility's network.

Keywords: *Sub-Saharan Africa, power-distribution systems, cost-effectiveness analysis, quasi-experimental design, infrastructure investment, developing economies, electrical grid reliability*

Article Highlights

- Quasi-experimental design applied to power-distribution equipment in Rwanda
- Difference-in-differences analysis reveals 17.3% lifecycle cost reduction
- Fault-tolerant switchgear outperforms conventional upgrade strategies
- Methodology enables robust field evaluation in developing economies

Methodological Insight

The study employs a difference-in-differences framework with robust standard errors clustered at substation level, analysing cost per unit of reliable energy delivered before and after equipment interventions.

This study provides empirical evidence for lifecycle cost considerations in infrastructure investment.

ABSTRACT-ONLY PUBLICATION

This is an abstract-only publication. The complete research paper with full methodology, results, discussion, and references is available upon request.

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