

Randomised Field Trial for Reliability Assessment of South African Power-Distribution Equipment

A Methodological Evaluation

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ABSTRACT

Background: The reliability assessment of power-distribution equipment in South Africa is critical for infrastructure planning and maintenance. Current reliability models often rely on laboratory data or historical failure rates, which may not accurately capture performance under diverse, real-world operational and environmental stresses.

Purpose and objectives: This working paper presents a methodological evaluation of a randomised field trial (RFT) designed to measure the in-service reliability of key distribution equipment, including transformers and circuit breakers. The primary objective is to assess the RFT's methodological rigour and feasibility for generating robust reliability data.

Keywords: *power-distribution reliability, randomised field trial, South African infrastructure, reliability assessment methodology, equipment failure analysis*

Article Highlights

- Stratified randomised design allocated equipment across climatic and load zones.
- Weibull proportional hazards model analysed right-censored failure data.
- Coastal regions showed a hazard ratio of 1.8 compared to inland temperate zones.
- Practical challenges in maintaining randomisation in live networks were identified.

Methodological Note

The analysis employs a Weibull proportional hazards model, reporting 95% confidence intervals for hazard ratios derived from the randomised field trial data.

This paper evaluates the methodological rigour of a field trial for reliability assessment.

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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