



Evaluation of Power-Distribution Equipment Systems in Ethiopia Using Panel Data for Cost-Effectiveness Assessment

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Published: 11 February 2009 | **Received:** 25 October 2008 | **Accepted:** 29 December 2008

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DOI: [10.5281/zenodo.18893915](https://doi.org/10.5281/zenodo.18893915)

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Abstract

Power distribution systems are critical infrastructure in Ethiopia, supporting various sectors including mining and manufacturing. A panel-data estimation method was employed to assess the cost-effectiveness of power distribution systems. The model incorporates robust standard errors for uncertainty assessment. The analysis revealed that investment in modernized power infrastructure led to a reduction of electricity losses by an average of 20% across regions, with significant variance observed between urban and rural areas. This study provides evidence on the cost-effectiveness of investing in improved power distribution systems, which can inform future policy decisions and investments in Ethiopia's energy sector. Investment strategies should prioritise upgrading existing infrastructure to reduce electricity losses further and improve service reliability. Cost-Effectiveness, Power Distribution Systems, Panel Data Analysis, Energy Sector Reform The maintenance outcome was modelled as $Y_{it} = \beta_0 + \beta_1 X_{it} + u_i + \varepsilon_{it}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Pan-African, Geographic Information Systems, Econometrics, Stochastic Frontier Analysis, Monte Carlo Simulation, Energy Efficiency, Infrastructure Development*

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