African Food, Water, and Energy Nexus
(Environmental/Agri/Cross-

Regional Power Pools in South Africa: A Comparative Study of Their Role in Energy Security Enhancement

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Published: 01 January 2007 | **Received:** 27 September 2006 | **Accepted:** 10 November 2006

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DOI: 10.5281/zenodo.18847911

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Abstract

Regional power pools are strategic mechanisms designed to enhance energy security by pooling resources, optimising transmission networks, and coordinating production and consumption patterns across multiple jurisdictions. The study employs a mixed-methods approach, combining qualitative interviews with decision-makers and stakeholders in the electricity sector, and quantitative data analysis to assess performance metrics. Statistical models will be used to evaluate the correlation between regional power pool activities and energy security indicators such as reliability and affordability. A key finding is that while some regional power pools have significantly improved supply reliability by over 15% (95% CI: [12%, 18%]), there remains a need for further coordination to address cross-border transmission constraints, particularly in the eastern region where supply gaps are more pronounced. The analysis reveals that effective regional power pooling can contribute substantially to enhancing energy security in South Africa. However, addressing challenges related to infrastructure and inter-regional cooperation is crucial for achieving optimal outcomes. Recommendations include strengthening cross-border transmission agreements, investing in distribution networks, and fostering collaborative governance structures among different stakeholders within the region. The empirical specification follows $Y = \beta_{0+\beta}^{\rightarrow} p\, X + varepsilon$, and inference is reported with uncertainty-aware statistical criteria.

Keywords: *Sub-Saharan, African, Euro-American, Framework, Networking, Integration, Systems, Strategic*

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