Insights into Power Markets and Infrastructure Security in Africa

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Introduction

- This paper addresses the challenge of inadequate electricity access in Africa from the perspective of regional power markets and prevention of vandalism.
- Access to reliable, affordable and sustainable energy is a universal aim enshrined in goal 7 of the Sustainable Development Goals of the United Nations.
- Inadequate electricity access is a significant challenge in Africa. Half of the population does not have electricity, highlighting a state of acute energy poverty.
- Energy in Africa is a scarcer commodity than in the rest of the world. Yet the highest growth in global energy demand is estimated to be recorded in Africa. The need for accelerated progress toward a more electrified, sustainable and prosperous Africa is undoubtedly great.

Problem and Theories of Electricity Access

The Problem at Hand

The question is how to meet Africa's electricity demand with sustainable, economic and environmentally friendly energy sources that fundamentally shift power systems and create a new development pathway.

Theories of Electricity Access

Several theories and approaches are advanced for solving this problem. It is argued that a combination of renewable energy technologies, policy reforms and innovative financing models is needed. This involves a fundamental shift from reliance on fossil fuels to a more diverse and distributed energy system powered by renewables like solar, wind and hydropower.

Problem and Theories continued

The key theories and approaches are:

- **Renewable Energy Transition**

Bypassing traditional reliance on fossil fuels by adopting cost-effective renewable energies like solar and wind.

- **Policy and Regulatory Frameworks**

➢ Enabling government policies that encourage private sector investment in renewable energies.

➢ Regional integration of energy markets facilitates cross-border electricity trade, optimizes resource utilization and reduces self-reliance among individual countries.

- **Financing and Investment**

It is vital to obtain capital through collaborations between governments, private entities and international funders.

Problem and Theories continued

- **Technological Innovation**

➢ Implementing smart grid technologies can optimize energy distribution, enhance grid stability and facilitate integration of variable renewable energy sources.

➢ Promoting energy efficiency measures in buildings, industries, and transportation can reduce energy wastage, increasing power available for consumption.

- **Social and Economic Considerations**

➢ Renewable energy solutions can provide access to electricity for millions of people in rural areas, improving living standards and enabling economic development.

➢ Involving local communities in the planning and implementation of renewable energy projects ensures social acceptance and sustainability.

Methodology/Approach

This is an action research studying the day-to-day problem of inadequate access to electricity in Africa in order to find the solution to it from the perspective or framework of regional power markets and vandalism prevention, so as to guide and evaluate the decisions and actions of practitioners in the field.

The study is theoretical, relying on a qualitative approach, using a desk study method of data collection from available literature.

Results and Discussion

Findings

- The key finding of the study is that Integrating regional power markets and protecting infrastructure increases access to electricity through smart grids that optimize energy flow, minimize losses and improve efficiency, leading to cost savings and more reliable power supply.

Other findings are-

- Electricity plays a very important role in human development and expanding access to reliable and affordable electricity sits at the heart of development.
- Integrating regional power markets and protecting electricity infrastructure concurrently is crucial in ensuring increased access to electricity in Africa. The two must move hand-in-hand, like the twin sides of a coin.

Results and Discussion continued

- Integration significantly increases electricity access by pooling resources, promoting economies of scale and facilitating energy trade, thereby allowing countries to access power from regional sources, supplement their national grids and share investments in large-scale infrastructure. Integration also enhances energy security and reduces costs by enabling more efficient resource utilization, reducing reliance on specific sources and promoting competition in the power sector.
- Infrastructure security directly increases access to electricity by ensuring a consistent and uninterrupted supply. When the grid is secure, more people can connect to it and those already connected can rely on a stable power supply.

Results and Discussion continued

Cross-border Electricity Trade and Regulatory Harmonization in Africa

- A power market is a system that enables the exchange of electrical energy, through an electrical grid.
- Africa has a single electricity market known as the Africa Single Electricity Market (AfSEM). It aspires to connect Africa's energy strategies and action plans by harmonising regulatory frameworks and integrating grid master plans, to allow for the diversification of energy sources supporting energy transition, better trade and investments exchanges and closing the energy infrastructure gaps between regions and countries.
- Cross-border power trade and regulatory harmonization is done through AfSEM and regional power pools, established by the AU's regional economic communities.

Results and Discussion continued

Opportunities of Regional Power Market Integration

- Competitive electricity prices: regional power pooling leads to lower electricity prices for consumers.
- Boosting electricity demand and access to electricity: reduced and affordable electricity prices boost demand for power and in turn enhance access.
- Cost-effectiveness: by pooling generation resources across a larger region, regional markets can utilize the most economical sources of electricity, potentially lowering costs for consumers and utilities.
- Improved security of supply: interconnecting power grids improves security of supply by, for example, reducing the risk of power outages or shortages.

Results and Discussion continued

- Stimulating economic growth and development: regional power markets create an attractive trade and investment climate that enhances economic prospects.
- Streamlining governance and harmonizing regulatory frameworks: sound regional power markets facilitate regional inter-government intervention to standardize electricity regulations for fairness to investors and trade.

Challenges of Regional Power Market Integration

- Lack of technical capacity: there is technical capacity deficit at regional and national levels, notably in general planning, engineering, project packaging and financing and project management.
- Lengthy tendering procedures: investors have identified long tendering procedures as a major stumbling block.

Results and Discussion continued

- Outdated infrastructure: aging transmission and distribution networks can limit the reliability and capacity of the integrated grid.
- Lack of coordination: some power pools in Africa do not have central agencies to coordinate the responsible actors and their activities, make real-time decisions and handle all constraints faced – all while keeping the system in balance.
- Political instability: conflicts can disrupt power supply and make it difficult to maintain the reliability of the integrated grid.
- Funding shortfalls: lack of funding for national electrification plans and infrastructure upgrades can hinder the development of regional power markets.

Unclassified

Results and Discussion continued

Infrastructure Security: Vandalism and its Impacts, Security Strategies and Policy Interventions.

- Infrastructure vandalism is the wilful destruction of electricity equipment.

Impacts of Infrastructure Vandalism

- Vandalism of electricity infrastructure immediately impacts those affected by either wholly cutting them off power supply or occasioning inadequacy in supply.
- Lack of electricity aggravates poverty, inequality and hampers government revenues.
- Infrastructure vandalism damages essential services, compromises national security, reduces quality of life and causes economic losses.

Unclassified

Results and Discussion continued

Security and Policy Strategies to Curb Vandalism

It is vital to curb vandalism through workable strategies.

- Physical security: install security cameras, motion-sensors and fencing to deter vandals and enhance surveillance.
- Community involvement: encourage community watch programs and public awareness campaigns to foster a sense of responsibility and ownership.
- Enforcing laws: ensure that anti-vandalism laws are effectively enforced and that vandals are held accountable for their actions.
- Address root causes: identify and address factors that may contribute to vandalism, such as poverty, unemployment and lack of opportunity.

References

- EU Technical Assistance Facility (TAF) for Sustainable Energy, *Policy Paper and Roadmap - Towards a Single African Electricity Market: Roadmap 2040* (2021).
- Ministry of Energy and Mineral Development, 'Statement on Vandalism of Electricity Infrastructure in the Country' (2021).
- Munetsi Madakufamba, 'Expanding energy generation capacity in SADC: Challenges and Opportunities for Power Sector Infrastructure Development', ***SOUTHERN AFRICA*** *Today* (2010) 1.
- Samuel Asumadu Sarkodie and Samuel Adams, 'Electricity access, human development index, governance and income inequality in Sub-Saharan Africa' *6 Energy Reports* (2020).
- The Electricity Act, Cap. 157 (Laws of Uganda, Revised Edition 2023).
- World Bank Group, 'An Evaluation of the World Bank Group's Support to Electricity Access in Sub-Saharan Africa, 2015–24' (2025).