

System Losses in Mission 300 Compact Nations: Comparative Analysis and Pathways for Ghana's Reform

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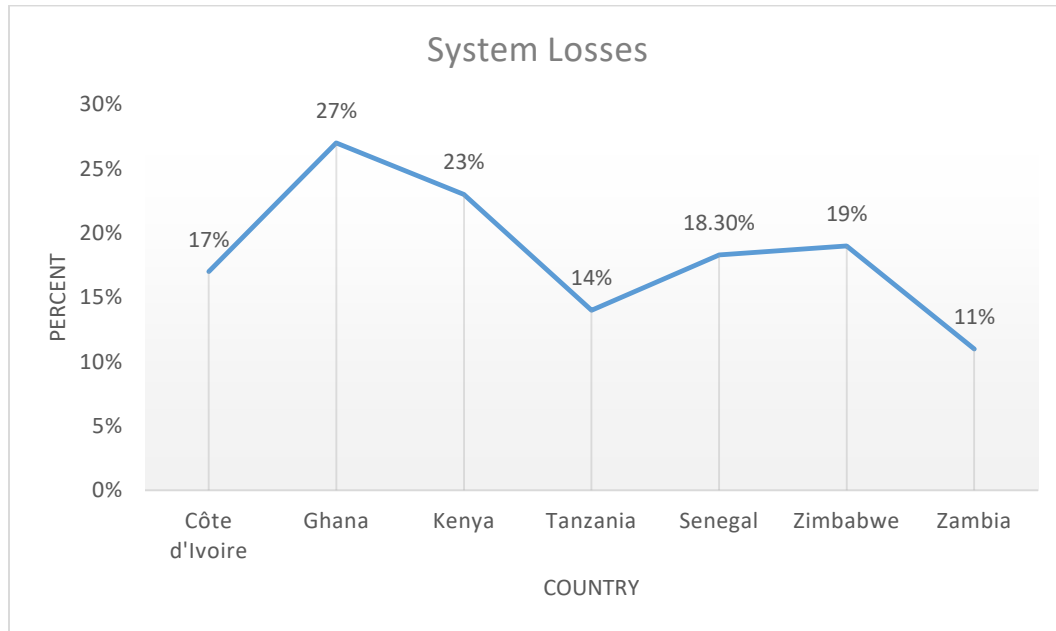
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Technical inefficiencies and commercial leakages in electricity distribution are a critical indicator of the operational and financial health of a nation's power sector. Efficiency is of importance because it directly affects the cost of fuel and electricity supply (Powanga & Kwakwa, 2023 & Ogundipe et. al. 2014). According to Modi (2017), in the case of transmission and distribution systems, the combined energy losses between the generation of electricity and the transfer to the meter of the customer should be less than 10%. In 2025, African countries submitted their Energy Compacts to the Mission 300 initiative, which outlines policy measures, investment needs, and targets for expanding energy access, reducing system losses, and integrating renewables. Among the twenty-nine (29) African countries that have submitted, data from seven (7) countries that fall in the same income bracket as Ghana i.e. low middle-income countries (LMIC) were selected for comparative analysis on their electricity sector operations. This report therefore provides a detailed comparative analysis of system losses of Côte d'Ivoire, Ghana, Kenya, Tanzania, Senegal, Zimbabwe, and Zambia and provides actionable recommendations towards Ghana's challenges.

Comparative Analysis of System Losses

Figure 1 presents a comparative overview of electricity system losses across seven (7) LMIC in Africa. System losses vary widely, reflecting differing levels of infrastructure investment, regulatory enforcement, and technological adoption. The data reveals stark contrasts: Zambia leads with losses as low as 11%, followed by Tanzania (14%), Côte d'Ivoire (17%), Senegal (18.3%), Zimbabwe (19%), Kenya (23%), and Ghana, which records the highest losses at 27% indicating relatively lesser grid efficiency. This gap highlights both challenges and opportunities as these nations pursue universal electrification under the Mission 300 framework.

Figure 1: System losses of seven LMIC countries



Source: Author's construct from *National Energy Compacts to the Mission 300* (Mission300Africa, n.d.)

Low-Loss Success Stories: Policy Lessons from Zambia and Tanzania

Zambia's achievement of 11% system losses stems from a multi-pronged strategy centered on modernization and accountability. The national utility ZESCO has rolled out Advanced Metering Infrastructure (AMI), replacing traditional meters with smart prepaid systems that minimize human intervention and curb theft. Zambia has over 50% of its end users on prepayment meters signifying their commitment to reducing theft and underpayment of used electricity. Furthermore, Zambia has established dedicated anti-theft units and streamlined legal processes to prosecute electricity fraud. Regular infrastructure audits and targeted upgrades of transformers and distribution lines have reduced technical losses, supported by funding from development partners focused on grid resilience.

Tanzania, with 14% losses, has prioritized institutional restructuring within TANESCO, including the creation of a Loss Reduction Division tasked with identifying high-loss areas and implementing corrective actions. The country has also invested in geographic information system

(GIS) mapping to visualize the network and detect illegal connections. Complementing this, Tanzania has promoted decentralized renewable energy systems in remote areas, reducing dependence on long, loss-prone transmission lines and improving overall system efficiency.

Similarly, Côte d'Ivoire (17%) and Senegal (18.3%) have implemented automated billing platforms and regularized network maintenance schedules, which enhance transparency and reduce commercial discrepancies. Both countries also engage in public awareness campaigns to discourage energy theft and encourage timely payment.

Ghana's Challenges: Why Losses Remain High

Ghana's 27% system losses are symptomatic of deeper structural issues. The distribution networks managed by ECG and NEDCo suffer from aging infrastructure, with overloaded transformers and undersized conductors, especially in peri-urban and high-growth areas. Commercial losses are exacerbated by widespread meter bypassing, illegal connections, and a culture of non-payment often compounded by political interference in tariff enforcement and revenue collection. Despite existing regulations, enforcement remains weak, and investment in modernizing the grid has been inconsistent due to financial constraints and subsidy dependencies.

Conclusion

By learning from lower-loss peers such as Zambia and Tanzania, Ghana can transform its distribution performance turning reduced losses into improved financial viability, enhanced service quality, and accelerated progress toward universal energy access under the Mission 300 compact. The journey will require political will, institutional coordination, and sustained investment, but the payoff, a more efficient, equitable, and resilient electricity system will be foundational to Ghana's energy future.

Strategic Recommendations for Ghana

To align with Mission 300 objectives and reduce losses toward the regional benchmark, Ghana must adopt an integrated, actionable strategy:

1. ***Accelerate Smart Meter Deployment:*** Prioritize AMI rollout in high-loss districts to enable real-time monitoring, accurate billing, and rapid theft detection.
2. ***Enhance Legal and Regulatory Enforcement:*** Strengthen the mandate of the Energy Commission and PURC to penalize electricity theft through dedicated utility courts and stricter prosecution.
3. ***Invest in Grid Modernization:*** Upgrade distribution lines, replace aging transformers, and implement reactive power compensation to reduce technical losses.
4. ***Leverage Data and Technology:*** Introduce GIS mapping and data analytics to identify loss hotspots, optimize load flows, and guide targeted interventions.
5. ***Launch Public Engagement Campaigns:*** Foster a culture of compliance through community education, incentivized reporting of illegal connections, and transparent disclosure of loss-reduction progress.
6. ***Secure Sustainable Financing:*** Utilize green bonds, development bank funding, and public-private partnerships to fund infrastructure upgrades without over-reliance on tariff increases.

References

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