Policy Guidelines for Accelerating the Energy Transition in Sub-Saharan Africa: Lessons from the Mobile Telecoms Sector

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Abstract

Sub-Saharan Africa faces immense challenges in its bid to attract capital to develop its energy resources and grow its economy. Relative to the pace of market penetration of cell phone services in the recent past, the growth in the share of the population with access to electricity has been rather dismal. The comparisons between both sectors are not new and have been made repeatedly over the years. This commentary recognizes that there are substantial differences between both sectors that make direct comparisons and a transfer of policy lessons difficult. It then identifies some key enablers of cellular telephony growth in Africa that can be applied to the electric power sector and refashions them into broad policy guidelines for boosting the pace of the energy transition on the subcontinent.

The challenge of energy sector growth in sub-Saharan Africa

Sub-Saharan Africa (SSA) is largely typified by insufficient infrastructure, energy poverty, and socioeconomic underdevelopment. For example, the International Energy Agency (IEA) notes that the percentage of the population of sub-Saharan Africa with access to clean cooking was 13 percent in 2018, and those with access to electricity were about 43 percent. The IEA also notes that sub-Saharan African countries would require about US$1.8 trillion to meet the targets of their energy policies between 2019 and 2040. Of this, electric power alone would account for about 50 percent.[1] However, the extent to which sub-Saharan African countries can raise and deploy this much-needed capital is uncertain, given that the 10-year average net annual Foreign Direct Investment (FDI) into sub-Saharan Africa is about US$38.5 billion while the annualized cost of energy investments per the governments' stated energy policies is about US$87billion (see figure 1).[2]

[1] World Energy Outlook Special Report, Africa Energy Outlook 2019. https://iea.blob.core.windows.net/assets/2f7b6170-d616-4dd7-a7ca-a65a3a332fc1/Africa_Energy_Outlook_2019.pdf
[2] Foreign direct investment, net inflows (BoP, current US$) - Sub-Saharan Africa. https://data.worldbank.org/indicator/BX.KLT.DINV.CD.WD?locations=ZG&view=chart

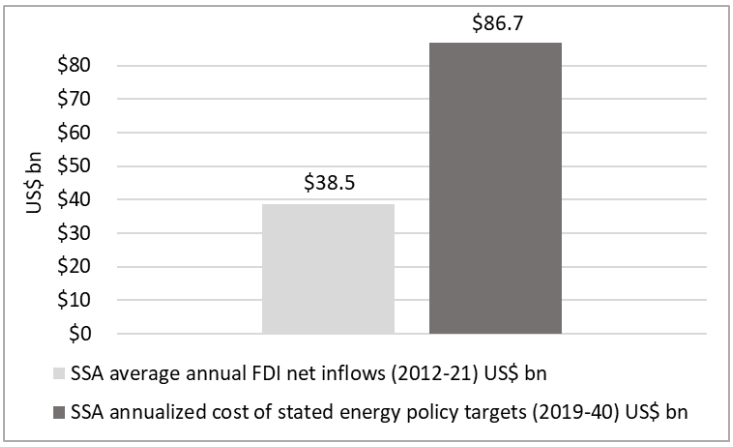

Figure 1: SSA 10-year average net FDI vs annualized cost of stated energy policy targets 2019-2040[3]

Sub-Saharan Africa's poor record in attracting investment into its non-extractive sectors has been due in part to unattractive policy and regulatory environments which have curtailed the growth of economically strategic sectors such as transportation and electric power supply. Despite this, the percentage of the population covered by cell phone services grew from about 2 percent in 2000 to about 60 percent in 2008.[4] In contrast, the percentage of the population with access to electric power grew from 26 percent to 32 percent over the same period.[5] By 2006, cell phone penetration surpassed that of electric power in sub-Saharan Africa as illustrated in figure 2 below.

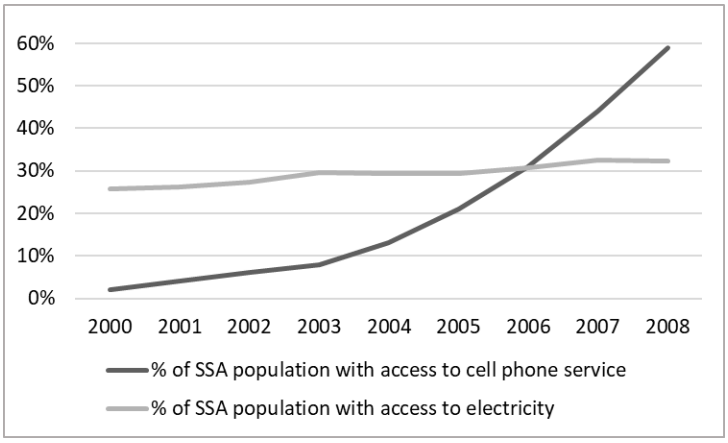

Figure 2: Percentage of SSA population with access to cell phone service and electricity, 2000-2008[6]

The growth of the cellular phone sector in sub-Saharan Africa was boosted in large part by changes in government policy. Sector deregulation facilitated the market entry of new service providers to

[3] FDI data was sourced from The World Bank database and stated energy policy investment targets from the World Energy Outlook Special Report, Africa Energy Outlook 2019.
[4] Aker, Jenny C., and Isaac M. Mbiti. 2010. "Mobile Phones and Economic Development in Africa." Journal of Economic Perspectives, 24 (3): 207-32. DOI: 10.1257/jep.24.3.207
[5] Electricity access data sourced from The World Bank Global Electrification Database. https://data.worldbank.org/indicator/EG.ELC.ACCS.ZS?locations=ZG
[6] Sourced from footnotes 4 and 5 above.

compete with incumbent public telco utilities. The new entrants successfully committed vast financial resources and top-notch operational prowess to rapidly roll out network infrastructure and provide services to millions of previously underserved customers. By 2022, the cellular telephone sector in sub-Saharan Africa had created more than 3.2 million jobs.[7] Though cell phone coverage grew from a smaller base and was, therefore, more likely to grow faster than electric power, that experience can provide lessons for expanding electric power supply despite key differences between both sectors. Some of these differences are discussed in the following section.

Some key differences between electric power and mobile telecoms

The impressive growth of mobile phone service in sub-Saharan Africa can provide key lessons for sub-Saharan Africa's energy transition. However, comparisons between both sectors have been made frequently over the years despite the reality of the mobile telephone sector being substantially different from the electric power sector in ways that make the transfer of lessons from one sector to another cumbersome or futile. Some key differences between both sectors relate to business operating models, revenue risk, high fixed costs, and land use requirements. These are highlighted below:

- **Business operating model:** Power utilities in sub-Saharan African countries have predominantly been operated as vertically integrated entities comprising generation, transmission, and distribution functions.[8] The limitations of this operating model have contributed to inadequate transparency and low accountability for poor performance in metering, billing, and collections capabilities, reliability, and operational efficiency across the electric power value chain. The International Finance Corporation (IFC) estimates that operational inefficiencies cause sub-Saharan African power utilities to lose about 23 percent of the energy produced relative to global average losses of 10 percent.[9] In addition, it is instructive that 88 percent of respondents in a 2015 PWC survey of African power producers forecast changes in their operating model thus indicating that current business models are unsuitable for future growth.[10] In contrast, with the deregulation of the 2000s, private telecom service providers that were granted licenses evolved their operating models to deliver infrastructure networks and adequate billing and collections processes to support rapid market growth and surpass incumbent telecom utilities within a few years.

[7] GSM Association, The Mobile Economy of Sub-Saharan Africa, 2022
[8] Scott, A., 2015. Building electricity supplies in Africa for growth and universal access. Background paper for Power, People, Planet: Seizing Africa's energy and climate opportunities. New Climate Economy, London and Washington, D.C. Available at: http://newclimateeconomy.report/misc/working-papers.
[9] IFC, "Better Utilities: Cutting Losses and Upping Energy Efficiencies". Accessed 01/23/23. https://www.ifc.org/wps/wcm/connect/news_ext_content/ifc_external_corporate_site/news+and+events/news/better_utilities
[10] PWC Africa Power & Utilities Sector Survey, 2015. https://www.pwc.com/gx/en/utilities/publications/assets/pwc-africa-power-utilities-survey.pdf

- **Revenue risk:** Widespread power theft has reduced the appetite for investment in the sub-Saharan Africa power sector.[11] Through illegal connections, many power consumers are off-the-books and not in official customer records. They are neither billed nor do they pay for service. In South Africa alone, annual losses due to theft were estimated to be about US$1.4bn in 2019.[12] In addition to metering and billing losses, utilities also experience theft of power cables which further increases the financial burden on power suppliers while reducing their operational reliability. In Ghana, researchers estimate that about 30 percent of the utility power supply is lost to illegal activities.[13] In contrast, mobile telecom sector revenue may be less susceptible to theft because a sizable portion of the customer base is billed in advance via the sale of prepaid products. Moreover, relative to electric power, which is billed in arrears, investors find shorter cash cycles associated with mobile telecom services to have lower commercial risks.
- **High fixed costs:** The level of fixed costs can be a proxy for relative commercial viability when comparing the attractiveness of the two sectors. The average connection cost for electricity in sub-Saharan Africa is about US$168 and rises to US$400 in some places.[14] This is a substantial cost given that the per capita gross national income of the region is about US$778.[15] Consequently, connecting customers to the electric power grid is a sizable commitment for both utilities and their customers and dampens market access and investment. In contrast, the cost of mobile telecom access was considerably lower at less than US$50 in the early 2000s. This lower cost boosted investor appetite for telecoms network Capex and resulted in rapid market penetration. Furthermore, in the 4 years it takes to build a thermal power generation plant (or about two years for some renewables plants), a mobile telco could roll out network infrastructure to add millions of additional mobile telecoms customers. This superior performance in time elapsed between investment and revenue generation can add considerably to the relative attractiveness of mobile telecoms over electric power. [16]
- **Land use requirements:** Land use requirements in the power sector also differ abundantly from the telecoms sector. Power transmission infrastructure from generation plants to load centers requires continuous tracts of land that cut across different jurisdictions and expansive terrain. Managing the buildout of such networks is complex and multi-tiered relative to mobile telecoms transmission networks which work using radio waves. Power

[11] IEA, Africa Energy Outlook 2022. https://iea.blob.core.windows.net/assets/6fa5a6c0-ca73-4a7f-a243-fb5e83ecfb94/AfricaEnergyOutlook2022.pdf

[12] N. O. Shokoya and A. K. Raji, "Electricity Theft: A Reason to Deploy Smart Grid in South Africa," *2019 International Conference on the Domestic Use of Energy (DUE)*, Wellington, South Africa, 2019, pp. 96-101.

[13] Osman Yakubu, Narendra Babu C., Osei Adjei, Electricity theft: Analysis of the underlying contributory factors in Ghana, Energy Policy, Volume 123, 2018, Pages 611-618, ISSN 0301-4215, https://doi.org/10.1016/j.enpol.2018.09.019.

[14] Scott, A., 2015. Building electricity supplies in Africa for growth and universal access. Background paper for Power, People, Planet: Seizing Africa's energy and climate opportunities. New Climate Economy, London and Washington, D.C. Available at: http://newclimateeconomy.report/misc/working-papers.

[15] The World Bank, GNI per capita, Atlas method (Current US$). Accessed 01/23/23. https://data.worldbank.org/indicator/NY.GNP.PCAP.CD?locations=ZG

[16] IEA, Average power generation construction time (capacity weighted), 2010-2018. Accessed 01/23/23. https://www.iea.org/data-and-statistics/charts/average-power-generation-construction-time-capacity-weighted-2010-2018

infrastructure, therefore, requires a higher level of investment in continuous physical transmission hardware. Both power generation and transmission are complex endeavors that require higher levels of investment in stakeholder management across multiple communities and jurisdictions. This increases the permitting burdens associated with power sector investments and the associated investment payback period. Without government backing or fiscal guarantees, the commercial risk associated with financing power projects reduces investor appetite relative to mobile telecom operations.

Key enablers of cell phone service growth in sub-Saharan Africa

Several different factors gave rise to the rapid penetration of cell phone service in sub-Saharan Africa in the 2000s. These include liberal policies relating to tariff-setting and geographical coverage requirements. The latter raised the economic potential of the sector and facilitated financing strategies that eased political resistance to reform. They are highlighted below.

- **Tariffs**: As part of the policy reform package, cell phone tariffs were subject to light-touch regulation with few constraints. Consequently, mobile telecom providers could charge commercially viable rates and thus improve the commercial prospects of the sector and raise its attractiveness to investors. On the other hand, power utilities had historically been subject to price controls given the politically sensitive nature of electric power access. This had the effect of reducing the commercial viability of investments in the sector and discouraging investments without sovereign financial guarantees from host governments.
- **Geographical balance requirements:** Some governments introduced the notion of geographically balanced national development into their development strategies to promote political stability. Such strategies called for channeling capital investments to politically sensitive but commercially marginal geographical zones. A notable enabler of mobile telecoms growth in sub-Saharan Africa was that the telecoms service providers weren't burdened by geographical balance requirements. They built their networks with higher priority given to high-revenue market segments, using the revenue received to extend networks into more marginal areas over time and with a lower financial burden.[17] In contrast, power utilities were subject to geographical balance constraints including rural electrification mandates. While the justification for rural electrification is valid in terms of relieving rural poverty, it can significantly undermine the commercial case needed to attract investment.
- **Political resistance:** Policy design reflects the interplay between competing interest groups. For example, incumbent interest groups may resist reform policies that promote greater competition due to fears of market share loss or challenges to their political power.[18] In sub-Saharan Africa, the new mobile telecoms entrants faced declining resistance to their emergence perhaps, in part due to the incumbents underestimating the competition or

[17] For instance, in Nigeria, the private mobile telecoms companies MTN and Econet developed their network infrastructure giving priority to the most commercially viable demand centers, the state-owned mTel which followed a 'geographical balance' network rollout strategy was unable to match the subscriber growth achieved by its private sector counterparts and lost market share.

[18] Stokes Leah Cardamore. 2020. Short Circuiting Policy: Interest Groups and the Battle Over Clean Energy and Climate Policy in the American States. New York NY: Oxford University Press.

because they had waning capacity for political resistance during the reform era. Concurrently, it is notable that the deregulation of the telecoms sector provided commercial opportunities for an emergent set of politically connected investors without precluding participation in such opportunities by the incumbents. This "all-comers" policy approach may have helped to prevent reform opponents from stifling reform and competition in the early 2000s.

Policy guidelines proposals for the energy transition in sub-Saharan Africa

Given the vast differences between both industries, the potential to apply "lessons learned" from mobile telecoms to future power sector development in sub-Saharan Africa is somewhat limited. Instead, it should be expected that even under the most investor-friendly regulatory regimes, achieving similar rates of growth and market penetration in electric power as in the mobile telephone sector is highly improbable. Therefore, the proposals in this commentary are focused narrowly on tariffs, geographical balance requirements, and overcoming political resistance. These are highlighted in the policy guidelines proposed below.

1. **Tariffs**: Regulators should exercise forbearance in the use of "fairness" regulations. Service providers should be allowed to establish discriminatory pricing policies that reflect the costs and risks of serving different customer tiers and market segments. Tariffs should be set according to market dictates as negotiated and agreed to by the producer, end-users, and other counterparties. The government's role in commercial agreements should be limited to ensuring the rule of law is upheld in dispute resolution transparently and expeditiously.
2. **Geographical balance requirements**: All regulators should refrain from placing geographical coverage quotas on private sector energy providers. Service providers should be allowed to establish their presence without the additional requirements to provide services in a manner that reflects political priorities such as rural-urban service quotas and similar requirements. This proposed constraint does not however extend to the establishment and enforcement of service levels and practices consistent with agreed health, safety, and environmental management standards.
3. **Political resistance**: Robust, well-funded, and well-organized resistance to energy policy reform can continue for an indeterminate period. Therefore, mitigation strategies should include mechanisms to co-opt the viewpoint and interests of some powerful opponents into the reform agenda. The purpose of this is to ensure that perceived threats to economic rent should be balanced with the possibility of continued participation on the part of policy opponents with vested interests in maintaining the status quo. The type of accommodation reached would differ by location according to the political reality on the ground in that location at the time of bargaining. The "all-comers" approach earlier adopted in mobile telecoms, whereby opportunities to participate in electric power commercial opportunities can create a powerful new interest group out of politically well-connected investors, can go a long way in strengthening the chances of success of energy sector reform proposals.

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