Sub-Saharan Africa electricity sector’s development: between centralized and decentralised technologies

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04/05/2021
In many sub-Saharan countries, the grid is struggling to keep up with demand and the investment gap remains huge.

Electrification plan: between grid extensions, mini-grids and SHS

The « classical » approach to electrification in SSA:
- Centralized grid for urban areas, mini-grids (disconnected from the centralized network) for peri-urban areas, individual systems for rural areas
- Depending on the existing grid and population density, electrification is mainly seen through this “prism”

Need to put back « electricity access » into context
- A typical sub-Saharan business suffers an average of 77 hours of blackouts per month (WB, WDI, 2020)
- Nigeria experienced an average of 32 power outages per month, each lasting 12 hours on average in 2014
- 384 hours of outage per month: the equivalent of 16 full days without electricity (WB, WDI, 2020)
- Considerable negative effect on economic activities, representing a cost ranging from 1 to 5 % of African national GDPs (Ouedraogo, 2017)
- Extreme case of Nigeria: economic costs estimated at > 29 billion of dollars/year (IMF, 2019)

- As a result: a colossal need for investments, which depend on the levels & quality of electricity access to be provided to the population
- For a « level 5 » access 120 billion $ per year until 2040 would be necessary, half of which in networks (IEA, 2019)
- However, in 2018, only 30 billion $ were invested, of which only 1/3 in networks and too little by the private sector (IEA, 2019)
A vicious circle maintaining obsolete grids: low operational efficiency and financial viability (1/2)

Electricity supply cost and revenue collected in $ per kWh billed (2014)

Transmission losses in a selection of countries (%) (2014)

A vicious circle maintaining obsolete grids: financial lock in = carbon lock in (2/2)

A vicious financial circle that constrains large scale renewable deployment

- Improving the financial viability of the sector, an essential condition for taking advantage of the centralized renewable potential of the region
Discrepancies between offer and demand: a market emerging

In countries where the network is unreliable, without quality improvement of services, populations and business are encouraged to use autonomous means of electricity production.

Consumers use several means to remedy the unreliability of the network and to optimize their electricity expenses (Rateau & Jagglin, 2020)

- More than half of businesses have or share a generator: more than 80% in the Republic of Congo, Sierra Leone and the Central African Republic, and more than 70% in Chad, Angola and South Sudan (WB, WDI, 2020)
- Nigeria, the aggregate installed capacity of diesel generators is estimated to be around 10 to 15 GW (Arik, 2019) or two to three times the available capacity of the central grid at around 6 GW for 2019 (NERC, 2019)

Factors:
1. Power outages: encourage businesses and households to invest in additional resources to meet their needs during blackouts
2. High cost of electricity: encourage these investments in order to reduce energy bills (SHS in particular)
3. Facilitated by higher purchasing power in urban areas
4. Environmental reasons (marginal)
Decentralized solar market opening up in urban and peri-urban areas

Decentralized solar systems’ penetration in the city of Bamako, Mali

- Market opening up to urban areas:
  - Pico / solar systems for residential,
  - Large hybrid systems for businesses

- Addition of electricity consumption means (Rateau, 2018)

- 700 millions new consumers in peri-urban & urban areas

Source: Ifri’s Center for Energy & Climate
Population growth and urbanisation rate: a challenge for the central grid, an opportunity for off-grid systems?

Mega-cities emerging

Universal access: a race against demography

Long term trends electrification goals cannot escape:
- Sub-Saharan population about 1.1 billion today, 2.1 billions in 2050 (UN, 2019)
- African urban population estimated to reach about 1.2 billion in 2050 (UN, 2019)
What pathway(s) will follow the development of sub-Saharan electricity sectors?

Medium / Long term trend:

- Could this reduce income from the sale of electricity to consumers less dependent on the central grid?
- And also more likely to refuse to pay their bills or dispute the invoice?

- How utilities react to these developments?
- What future role for utilities? Flexibility / reliability providers?

- What are the prospects of large centralized projects (IPPs) in this context?

Unpaid bills significantly reduces financial viability of utilities

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