A new paradigm for Sub-Saharan electricity sectors: toward fragmented but more sustainable grids in cities?

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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
- Nigeria experienced an average of 32 power outages per month, each lasting 12 hours on average
- Considerable negative effect on economic activities, representing a cost ranging from 1 to 5% of African national GDPs

- A colossal need for investments, which depend on the levels & quality of electricity access to be provided to the population
- Level 5 access = 120 billion $ per year until 2040 would be necessary, half of which in networks
- But in 2019, only 25 billion $ were invested, of which only 1/3 in networks
A vicious circle maintaining obsolete grids: low operational efficiency and financial viability (1/2)

Electricity supply cost and revenue collected in $ per kWh billed, most recent data available

Transmission losses in a selection of countries (%), most recent data available

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 is an essential condition for taking advantage of the centralized renewable potential of the region.

Financial difficulties for utilities & risks for the private sector

- Autonomisation of consumers
- Unpaid bills

Low-risk investments with high OPEX and low CAPEX (ex: emergency generators)

- Poor quality of service: power cuts
- Low maintenance: increase in technical and non-technical losses

Consumers

Utilities

Producers
Discrepancies between supply and demand: an old market for diesel generators, a new market for solar?

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

- 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.

- Nigeria, the aggregate installed capacity of diesel generators is estimated to be around 14 GW, two to three times the available capacity of the central grid at around 6 GW for 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).

Source: World Bank, World Development Indicators.
Medium and long term trends and impacts of the crises

- Trend is reducing income from the sale of electricity to consumers less dependent on the central grid and makes consumers more likely to refuse to pay or dispute the invoice.
- From the analysis it appears that lucrative consumers in urban areas tend to invest in solar amongst other factors.
  - **IMPORTANT** consequences on the strategy of deploying central grid to poor consumers through cross subsidies.

- **The future role of utilities.** Depending on the country different model will appear:
  - Utilities could disappear
  - Utilities manage to find ways to fully integrate those new uses in the system, notably through the use of “smart grid” technologies (strong and reliable electricity sectors such as Togo’s).
  - Between those two:
    - Reliable and modern electricity sector in central urban areas
    - Hybridization of electricity use and partial withdrawal of utilities in weak grid areas

- **Prospects of large centralized projects (IPPs)**
  - Overall a reduction in big sized projects (+ 50 MW) limited near economic areas
  - Increase in number of medium to small sized projects (20 MW+)

- The development of renewable plants backed by large storage (South Africa / Senegal) and industrial areas (Togo)

- The rapid urbanization along with new technologies emerging on the backdrop of an unreliable network incite consumers to become less dependent on the central grid.
- It could generate a bottleneck effect which would reduce the demand for electricity and thus in turn squeeze the development of the IPPs market.
- International funding agencies could help integrate those new uses into the grid by investing particularly in grid infrastructures which remain the backbone of the continent’s power sector.
